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ABSTRACT

Developed as part of the Marine Corps Institute (MCI) correspondence training program, this course on basic warehousing is designed to provide Marines with Military Occupation Speciality 3051 in the rank of private through corporal with instruction in those basic principles, methods, and procedures that can be applied to any warehousing or storage operation. It is adaptable for nonmilitary instruction. Introductory materials include specific information for MCI students and a study guide (guidelines to complete the course). The 14-hour course consists of four study units. Each unit contains a text and a lesson sheet that details the study assignment and sets forth the lesson objective. A written assignment is also provided. Topics covered in the lessons include introduction to storage, stock location and materials handling procedures, preservation and packing procedures, and field warehousing and storage operations. (YLB)

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ARLINGTON, VA. 22222

30.1k
15 MAR 1984

1. ORIGIN

MCI course 30.1k, BASIC WAREHOUSING, has been prepared by the Marine Corps Institute.

2. APPLICABILITY

This course is for instructional purposes only.

H. M. McIlroy Jr.

H. M. MCILROY, Jr.
Major, U. S. Marine Corps
Acting Deputy Director

MC1-R241

INFORMATION

FOR

MCI STUDENTS

Welcome to the Marine Corps Institute training program. Your interest in self-improvement and increased professional competence is noteworthy.

Information is provided below to assist you in completing the course. Please read this guidance before proceeding with your studies.

1. MATERIALS

Check your course materials. You should have all the materials listed in the "Course Introduction." In addition you should have enough envelopes to mail all lessons back to MCI unless your lesson answer sheets are of the self-mailing type. If your answer sheets are of the preprinted type, check to see that your name, rank, and social security number are correct. Check closely, your MCI records are kept on a computer and any discrepancy in the above information may cause your subsequent activity to go unrecorded. You may correct the information directly on the answer sheet. If you find a discrepancy and correct it, ensure that you correct this information on all your answer sheets. If you did not receive all your materials, use the enclosed Student Request/Inquiry (MCI-R14__) to notify MCI of this fact and what you require. (Note: The MCI-R14__ may be mailed to MCI without envelope or stamp).

2. LESSON SUBMISSION

Submit your lessons on the answer sheets provided. Complete all blocks and follow directions on the answer sheet for mailing. In courses in which the work is submitted on blank paper or printed forms, identify each sheet in the following manner:

DOE, John J. Sgt 332-11-9999
44.1, Procedures of Legal Administration
Lesson 3
Military or office address
(RUC number, if available)

Otherwise, your answer sheet may be delayed or lost. If you have to interrupt your studies for any reason, contact your training NCO who will request a single six month extension of time, which is added to the original Course Completion Deadline (CCD) date. If you are not attached to a Marine Corps unit you may make this request by submitting the enclosed MCI-R14__, or

by calling the Registrar Division on AUTOVON 288-4175/2299/6293 or commercial (202) 433-5174/2299/2691. You are allowed one year from the date of enrollment to complete this course. Your commanding officer is notified of your status through the monthly Unit Activity Report. In the event of difficulty, contact your training NCO or MCI immediately.

3. ENROLLMENT/MAIL TIME DELAY

Presented below are the Enrollment/Mail Time delays. Column I represents the First Class mail time from MCI to the designated geographical location or from your location to MCI. All correspondence is sent via First Class mail. Course materials are sent via Special Fourth Class Book Rate.) You should add five working days for our processing. Example: Eastern U.S. - 3 days mailing time to MCI + 5 working days MCI processing + 3 days mailing time back to the unit = 11 days. Column II represents Regular Mail from the time when the enrollment application is mailed until the unit receives the course. Example: Eastern U.S. - Enrollment application 3 days mailing time to MCI + 5 working days MCI processing + 6 days mailing time to the unit = 14 days.

GEOGRAPHIC AREA	COLUMN 1	COLUMN 2
EASTERN U.S.	3	14
WESTERN U.S.	4	19
FPO NEW YORK	5	21
DEPT. OF STATE MARINE SECURITY GUARD	7	24
HAWAII (NON-FPO)	5	12
FPO SAN FRANCISCO	7	27
FPO SEATTLE	6	23

Note: These times represent the service standard. The actual times may vary. If the delay you are experiencing is excessive, please contact the MCI Registrar by phone, message, or letter, so that we may take action.

4. GRADING SYSTEM

LESSONS			EXAMS	
GRADE	PERCENT	MEANING	GRADE	PERCENT
A	94-100	----- EXCELLENT	----- A	94-100
B	86-93	----- ABOVE AVERAGE	----- B	86-93
C	78-85	----- AVERAGE	----- C	78-85
D	70-77	----- BELOW AVERAGE	----- D	65-77
NL	BELOW 70	----- FAILING	----- F	BELOW 65

You will receive a percentage grade for your lessons and for the final examination, along with a reference sheet (MCI R69), indicating the questions incorrectly answered. All lessons must be COMPLETED AND PASSED before you will be administered an exam. The grade attained on the final exam is your course grade.

5. FINAL EXAMINATION

ACTIVE DUTY PERSONNEL: When you submit your LAST LESSON, your exam will be mailed automatically to your commanding officer. The administration of MCI final examinations must be supervised by a commissioned or warrant officer, or a staff NCO (equivalent or higher), and it must be validated by the administrator.

INACTIVE DUTY OR CIVILIAN EMPLOYEE: The exam may be supervised by a director of civilian personnel, civilian training officer, clergyman, or local school official

6. COMPLETION CERTIFICATE

The completion certificate will be mailed to your commanding officer. For non-Marines, it is mailed to your supervisor or directly to you, as appropriate.

7. RESERVE RETIREMENT CREDITS

Reserve retirement credits are awarded to inactive duty personnel only. Credits awarded for each course are listed in the "Course Introduction" and are only awarded upon successful completion of the course. Reserve retirement credits are not awarded for MCI study performed during drill periods if credits are also awarded for drill attendance.

8. DISENROLLMENT

Only your commanding officer can request your disenrollment from an MCI course since this action will adversely affect the unit's completion rate.

9. ASSISTANCE

Consult your training NCO in the event of course content problems. If he is unable to assist you, MCI is ready to help you whenever you need it. Please use the enclosed Student Course Content Assistance Request (T&E-1) or call the Autovon telephone number listed below for the appropriate course writer section.

PERSONNEL/ADMINISTRATION/LOGISTICS/CORRECTIONS	288-3259
COMMUNICATIONS/ELECTRONICS/AVIATION/NBC	288-3604
INFANTRY	288-3611
ENGINEER/MOTOR TRANSPORT/UTILITIES	288-2275
SUPPLY/FOOD SERVICES/FISCAL	288-2285
TANKS/ARTILLERY/SMALL ARMS REPAIR/AAV	288-2290
For administrative problems call the MCI Hotline:	288-4175

For commercial phone lines, use area code 202 and prefix 433 instead of 288.

STUDY GUIDE

10. STUDY HINTS

By enrolling in this course, you have shown a desire to improve the skills you need for effective job performance, and MCI has provided materials to help you achieve your goal. Now all you need is to develop your own method for using these materials to best advantage.

The following guidelines present a four-part approach to completing your MCI course successfully:

- Make a "reconnaissance" of your materials;
- Plan your study time and choose a good study environment;
- Study thoroughly and systematically;
- Prepare for the final exam.

a. MAKE A "RECONNAISSANCE" OF YOUR MATERIALS

Begin with a look at the course introduction page. Read the COURSE INTRODUCTION to get the "big picture" of the course. Then read the MATERIALS section near the bottom of the page to find out which text(s) and study aids you should have received with the course. If any of the listed materials are missing, see paragraph 1 of this pamphlet to find out how to get them. If you have everything that is listed, you are ready to 'reconnoiter' your MCI course.

Read through the table(s) of contents of your text(s). Note the various subjects covered in the course and the order in which they are taught. Leaf through the text(s) and look at the illustrations. Read a few lesson questions to get an idea of the types that are asked. If MCI provides other study aids, such as a slide rule or a plotting board, familiarize yourself with them. Now, get down to specifics!

b. PLAN YOUR STUDY TIME AND CHOOSE A GOOD STUDY ENVIRONMENT

From looking over the course materials, you should have some idea of how much study you will need to complete this course. But "some idea" is not enough. You need to work up a personal study plan; the following steps should give you some help.

(1) Get a calendar and mark those days of the week when you have time free for study. Two study periods per week, each lasting 1 to 3 hours, are suggested for completing the minimum two lessons required each month by MCI. Of course, work and other schedules are not the same for everyone. The important thing is that you schedule a regular time for study on the same days of each week.

(2) Read the course introduction page again. The section marked ORDER OF STUDIES tells you the number of lessons in the course and the approximate number of study hours you will need to complete each lesson. Plug these study hours into your schedule. For example, if you set aside two 2-hour study periods each week and the ORDER OF STUDIES estimates 2 study hours for your first lesson, you could easily schedule and complete the first lesson in one study period. On your calendar you would mark "Lesson 1" on the appropriate day. Suppose that the second lesson of your course requires 3 study hours. In that case, you would divide the lesson in half and work on each half during a separate study period. You would mark your calendar accordingly. Indicate on your calendar exactly when you plan to work on each lesson for the entire course. Do not forget to schedule one or two study periods to prepare for the final exam.

③ Stick to your schedule.

Besides planning your study time, you should also choose a study environment that is right for you. Most people need a quiet place for study, like a library or a reading lounge; other people study better where there is background music; still others prefer to study out-of-doors. You must choose your study environment carefully so that it fits your individual needs.

c. STUDY THOROUGHLY AND SYSTEMATICALLY

Armed with a workable schedule and situated in a good study environment, you are now ready to attack your course, lesson by lesson. You will find your first study assignment and your first written assignment on page 1 of lesson 1. On this page you will also find the lesson objective, a statement of what you should be able to do after completing the assignments.

DO NOT begin by reading the lesson questions and flipping through the text for answers. If you do so, you will prepare to fail, not pass, the final exam. Instead, proceed as follows:

① Read the study assignments carefully. Make notes on the ideas you feel are important and mark any portion you have difficulty understanding.

② Reread the portions you marked in step ① . When you have mastered the study assignment, start to work on the written assignment.

③ Read each question in the written assignment carefully.

④ Answer all questions that you are sure of and leave the others blank.

⑤ Reread the portions of the study assignment that explain the items you left blank.

⑥ Complete the written assignment and send it to MCI for grading.

⑦ Go on to the next lesson.

Follow the same procedure for each lesson of the course. If you have problems with the text or lesson questions that you cannot solve on your own, ask your section OIC or NCOIC for help. If he cannot aid you, request assistance from MCI on the MCI Student Course Content Assistance Request included in this pamphlet.

When you have passed the final lesson, the final exam will be sent to your training officer or NCO.

d. PREPARE FOR THE FINAL EXAM

How do you prepare for the final exam? Follow these three steps:

① Review each lesson objective as a summary of what was taught in the course.

② Reread all portions of the text that you found particularly difficult.

③ Review all the lesson questions, paying special attention to those you missed the first time around.

If you follow these simple steps, you should do well on the final. GOOD LUCK!

BASIC WAREHOUSING

Course Introduction

BASIC WAREHOUSING is written for Marines with MOS 3051, in the rank of Private through Corporal, who perform warehousing duties. Instruction is offered in those basic principles, methods, and procedures which can be applied to any warehousing or storage operation.

ADMINISTRATIVE INFORMATION

ORDER OF STUDIES

Lesson Number	Study Hours	Subject Matter
1	3	Introduction to Storage
2	3	Stock Location and Materials Handling Procedures
3	3	Preservation and Packing Procedures
4	2	Field Warehousing and Storage Operations
	3	FINAL EXAMINATION
	14	

RESERVE RETIREMENT CREDITS: 5

EXAMINATION: Supervised final examination without textbook or notes with a time limit of 3 hours.

MATERIALS: MCI 03.1k, Basic Warehousing.
Lesson sheets and answer sheets.

RETURN OF MATERIALS: Students who successfully complete this course are permitted to keep the course materials.

Students disenrolled for inactivity or at the request of their commanding officer will return all course materials.

SOURCE MATERIALS

DLO 4145.19-R-1 Storage and Materials Handling Manual, dated September 1979
NAVMC 1101, Vol II Storage and Materials Handling Manual, dated July 1971
MCO P4030.36 Marine Corps Packaging Manual, dated April 1982
MCO P4030.21C Preservation, Packaging and Packing of Military Supplies and Equipment, Packing, (Vol II), dated September 1974
MCO P4030.31B Preservation, Packaging and Packing of Military Supplies and Equipment, Preservation and Packaging, (Vol I), dated June 1977
MCO P4450.7D Marine Corps Warehousing Manual, dated October 1979
MCO P2740.1C Packaging of Supplies for Parcel Post Shipment, dated April 1977
MCO P4030.19D Packaging and Handling of Dangerous Materials for Transportation by Military Aircraft, (W/Ch 4), dated March 1976
MCO P4400.75B Mechanization of Warehousing and Shipment Processing (MOWASP) Manual, (W/Ch 2), dated August 1975
MIL-P-116H Methods of Preservation, dated December 1980
MIL-STD-129H Marking for Shipment and Storage, dated January 1982

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Chapter 1

INTRODUCTION TO WAREHOUSING OF MATERIAL

Section I. GENERAL

1-1. INTRODUCTION

This course is offered by MCI to help you perform your warehousing duties. The subject matter of this course includes most of the warehousing operations you will encounter. This chapter gives you a look at the overall storage operation and how you fit into this operation; it introduces you to the types of warehousing facilities you will use, and it emphasizes principles of space planning as applied to warehouses, sheds, and open storage areas. It also includes an introduction to the Mechanization of Warehousing and Shipment Processing (MOWASP), and the Marine Corps Distribution System. The next two chapters deal with the location, handling, packing receiving, and shipping procedures involved in your day-to-day storage operation. The last chapter presents current information on field warehousing operations. Throughout the four chapters, you will encounter instruction on the application of safety practices in your warehousing operations.

1-2. PUBLICATIONS USED IN WAREHOUSING

One of the continuing problems in the Marine Corps is determining where to find the written instructions necessary for effective and efficient operations. The purpose of this paragraph is to help you find the current sources of instruction on warehousing procedures.

a. Storage and Materials Handling Manual (DOD 4145.19-R-1). This is the basic warehousing manual for the entire Department of Defense. It is used at the Marine Corps logistic bases and remote storage activities; it may be used by any other activity which can adopt all or portions of its contents. This manual presents the principles and procedures of warehousing, as well as on-the-job training courses for storage personnel, and materials handling equipment operators. It is available at all activities having a storage operation.

b. Marine Corps Warehousing Manual (MCO P4450.7D). The primary purpose of this manual is to provide instruction and procedures used in the Marine Corps warehousing program. This manual contains instructions on disestablishing and inactivating facilities, warehousing of material within the Marine Corps stores system, establishment of a standard field warehouse system, and reporting the utilization of available storage space inside a warehouse.

c. Marine Corps Directives. Marine Corps directives are published to specify Marine Corps policy and implement additional instructions from the Navy Department and Department of Defense. A complete set of these directives is maintained in the administrative office and a set of those pertaining to supply is kept in the supply office. The warehouse office should have a copy of those pertaining to warehousing. Marine Corps Bulletin 5215 is distributed semi-annually. It is an index of the current Marine Corps orders and Marine Corps bulletins, refer to this bulletin to determine the current effective directives.

1-3. WAREHOUSING OPERATIONS

The operations performed at any storage activity are to unload trucks, receive, check-in, and store incoming supplies; and when necessary, to inspect, classify, and identify supplies; to care for and preserve supplies in storage; to preserve, pack, crate, bale, and mark supplies for storage and shipment; to check out and load supplies to be shipped; and to perform other related functions. In the Marine Corps, storage is the placing of property in a warehouse, shed, or open area and keeping it there until it is needed. Storage in this sense is a continuation of the receiving operation and is preliminary to the shipping or issuing operation. Supplies in "active" storage are in one phase of their journey from factory to consumer; practically all Marine Corps storage falls into this category. A tremendous variety of products flow through the Marine Corps storage system. These products are received, arranged into logically related groups, stored in specific locations, inspected and protected, and finally shipped to the requisitioning organization. Performing Marine Corps storage functions requires the use of three basic resources: space, manpower, and materials handling equipment. The organizations that have a storage mission are listed in paragraphs a through d below:

a. Marine Corps Logistic bases (MCLB's). The MCLB's are responsible for receiving, storing, maintaining, issuing, and/or shipping Marine Corps peculiar material as directed by the Inventory Control Point (ICP), as well as prepositioned war reserve and initial issue material. For this reason, they have extensive storage facilities, including large permanent warehouses. One MCLB is located at Albany, Georgia and the other is located at Barstow, California.

b. Force Service Support Groups (FSSG's). Their primary mission is to provide sustained logistical support to a division/wing air-ground task force, including isolated components. Their mission includes all functions related to requisitioning, accounting, storage, and issue of all classes of supply, and field maintenance of material. The Direct Supply Support Control (DSSC) activity outlet of Base Material Battalion furnishes housekeeping supplies for day-to-day use by those Fleet Marine Force (FMF) units in garrison which are normally furnished by the FSSG under tactical situations.

c. SASSY Management Unit (SMU). The SMU has the mission of receiving, storing, maintaining, and issuing all classes of supplies to the FMF using units for the FSSG; that is, FMF battalions and separate units submit their requisitions to the SMU. The requisition is then either filled, backordered, or forwarded to the ICP (Marine Corps peculiar items) or the appropriate integrated item manager (IMM). Its mission includes maintaining a centralized mount-out for all FMF units.

d. Marine Wing Support Groups (MWSG's). The supply section of the MWSG obtains the bulk of its supplies from the Navy, but also depends upon the Marine Corps supply system (SASSY) for some of its basic needs. For example, the Navy furnishes all aeronautical supplies and equipment (aircraft spare parts, aviation fuel, and lubricants, aircraft repair equipment, and the like). On the other hand, the Marine Corps furnishes all ground related items, i.e., motor transport equipment (military), ground communications equipment, spare parts, 782 gear, etc.

1-4. STORAGE SPACE

Storage space is generally divided into two categories, covered space and open space. As taught herein, covered space is primarily represented by warehouses and sheds, while open space (outside areas) may be either improved or unimproved lots.

a. Warehouses. A warehouse is a building used for the storage of items which cannot be exposed to the weather. It is a structure which has a roof and, except for doors, is completely enclosed on all sides. Generally speaking, there are two basic types of warehouses, the general-purpose and the special-purpose warehouse. The general-purpose warehouse is used for the storage of items which do not require special attention. The special-purpose warehouse is used for the storage of items which require special storage precautions, such as flammables or items that require refrigeration. The general-purpose warehouse is usually the most common type of covered storage space at most activities. Warehouses may be either single-story or multistory buildings, depending primarily on ground space limitations at a particular storage installation. The single-story warehouse is by far the most advantageous for storage operations because the entire operation is on one level. Storage operations are hampered in a multistory warehouse because operations must be conducted at several levels. Other characteristics of the single-story and multistory warehouse are as follows:

(1) Single-story warehouses. The single-story warehouse provides for a straight-line flow of supplies from boxcars or trucks to the stacking location. By straight-line flow, we mean that the movement of materials should involve the shortest distance between two points. The floorload capacity is practically unlimited, thereby allowing maximum use of vertical and horizontal space. There are, of course, posts and columns in a single-story warehouse; however, they are fewer and smaller than those in the multistory warehouse because they have only the roof to support. Performance standards for unloading and storing equal quantities of the same items at both single-story and multistory warehouses show that nearly twice as many man-hours are required at the multistory warehouses. The use of the single-story warehouse does, however, require greater ground space.

(2) Multistory warehouses. The multistory warehouse has disadvantages when compared with the single-story warehouse. The multistory warehouse must have either freight elevators or ramps to move supplies to upper floors. These elevators or ramps take up space. The large posts and columns required to support upper floors also take up more space. The floorload capacity of upper floors is limited because of the type of construction. Posts and columns cannot hold up the weight that a ground floor can. The maximum stacking height on upper floors will be less because of this limited floorload capacity, thus storage space is wasted because this vertical space cannot be used. The multistory warehouse does have the obvious advantage of requiring less ground area for construction.

b. Storage sheds. Supplies which need protection from the elements (sun, rain, snow), but not from temperature or humidity variations, are ordinarily stored in sheds. A shed

(fig 1-1) is a roofed structure that is not completely enclosed. It is a compromise between open storage and warehouse storage because it offers more protection to supplies than open storage but less than warehouse storage, and because it costs more to construct and operate than an open storage area but less than warehouse storage. Items of supply to be stored in sheds or open storage areas will be designated by the storage officer.

Fig 1-1. Side view of a storage shed.

c. Open storage. Open storage is an unroofed area used for the storage of military supplies. It is the cheapest form of storage. Earlier you learned that open storage areas are designated as either improved or unimproved lots. Open storage areas are used for supplies which are not affected by weather.

(1) Improved. An improved area (fig 1-2) has been graded and, if necessary, surfaced with some suitable material that permits efficient materials handling operations.

Fig 1-2. Open storage area improved by use of steel mats.

(2) Unimproved. An unimproved area (fig 1-3) is unsurfaced, but can be used for some storage operations.

Fig 1-3. Semi-trailers stored in an open unimproved area.

1-5. TYPES OF WAREHOUSES

a. The general-purpose warehouse

(1) Description. The general-purpose warehouse (fig 1-4) is a roofed structure with complete side and end walls. It has a truckloading platform on one side and a carloading platform on the other side; some have a canopy over them so that operations are not affected by bad weather. The platforms are on the same level as the warehouse floor, thereby permitting materials handling equipment to load and unload trucks and rail cars easily from any warehouse door. Inside the general purpose warehouse, the space is divided into sections by firewalls. The sections are further divided by aisles, into storage bays or blocks. These aisles provide access to each item stored and to the doors on either side of the warehouse.

Fig 1-4. General-purpose warehouse.

(2) Storage layout. A variety of items may be stored in a general-purpose warehouse, and the layouts illustrated in figure 1-5 are typical of those used at most storage installations. The arrows in the illustration indicate the direction of storage for various storage lots. The direction of storage is the direction that the supplies are removed from stock. Items are stored from the walls in end bays and from imaginary lines in center bays, out to the aisles. This method of storage uses maximum floor space while permitting access to stacks by materials handling equipment. Two main aisles run the entire length of the general-purpose warehouse, allowing materials handling equipment to move without interruption throughout the building and allowing straight-line flow of supplies. Cross aisles furnish direct access to stacks from both carloading and truckloading platforms. Aisle widths are limited to the size required for operation of materials handling equipment needed to handle the unit loads in storage.

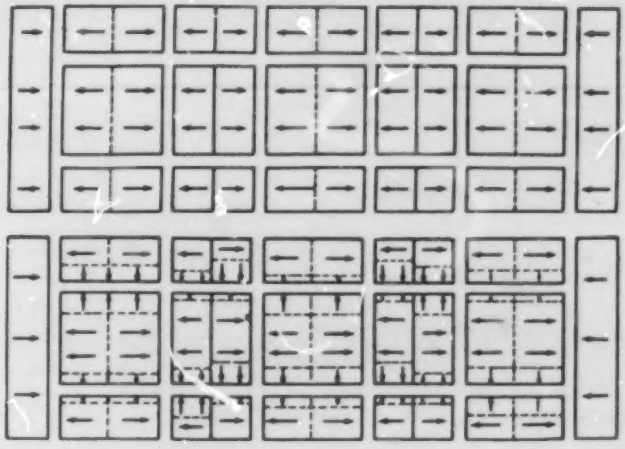

Fig 1-5. Typical storage layouts for a general-purpose warehouse.

b. Special-purpose warehouse. Special-purpose warehouses are storage buildings which have special built-in features to accomodate supplies that require special treatment. Warehouses which fall into this category are the controlled humidity, refrigerated, flammable storage warehouses, and the magazine (above ground magazine or igloo).

(1) Controlled humidity warehouse. A controlled humidity warehouse is a warehouse that has been properly sealed and conditioned so that the humidity can be maintained within prescribed limits. Controlled humidity storage has proven to be the most economical and efficient method of storage for many items (such as electrical assemblies that are difficult to maintain) and its use is increasing. The number of controlled humidity warehouses required at an activity depends on the assigned mission and the nature of the materials to be stored. The general purpose warehouse is the most acceptable structure for conversion to a controlled humidity warehouse.

(2) Refrigerated warehouse. Refrigerated warehouses are required at activities that distribute perishable subsistence items (such as fresh vegetables). Items such as dry cell batteries should also be stored in refrigerated warehouses. Refrigerated warehouses are usually divided into two distinct areas. One area is designed as chill space, in which the temperature can be controlled between 32° and 50° F, the other area is designed as freeze space, in which the temperature can be controlled below 32° F. A typical refrigerated warehouse has a truckloading platform and a carloading platform that runs the entire length of the warehouse. Because refrigerated warehouses are divided into compartments designed as chill space and freeze space, there will normally not be main aisles running the length of the warehouse. Cross aisles connect the carloading and truckloading platforms. Doors open off these platforms to the cross aisles for access of materials handling equipment to storage areas.

(3) Flammable-storage warehouse. A flammable-storage warehouse is used for the storage of highly combustible materials such as paint and oils; it is constructed of noncombustible materials. Typical flammable-storage warehouses have one or more compartments, each separated by a firewall. Some flammable-storage warehouses are built at truck-bed and car-floor level; others are built at ground level with ramps leading up to a loading platform. The flammable-storage warehouse has firewalls with a four-hour fire resistance rating. Firewalls without doors are preferred because greater fire protection results. However, the omission of doors in the firewalls makes it necessary to sort, classify, and segregate supplies carefully during the unloading operation. Once supplies have been assigned to separate compartments, there is no opportunity to transfer them between compartments by movement within the building. Fire protection is primarily dependent on an automatic deluge-type sprinkler system connected to an adequate water supply. Because flammable-storage warehouses are special-purpose warehouses, their size and construction features vary at different storage activities.

(4) Magazines. The two types of magazines are aboveground magazines and igloos. An aboveground magazine (fig 1-6) is designed for the storage of ammunition and explosives. Because of the nature of the items stored in them, aboveground magazines are built of fireproof materials and are well ventilated to lessen the danger of an explosion, and are widely separated to minimize the destructiveness of an explosion if one should occur. Inside an aboveground magazine, small-arms ammunition is stacked to allow at least two feet between the stock and the level of the roof or arch of the magazine. Although small-arms ammunition is sometimes stored in a general purpose warehouse, it does not make the warehouse a magazine because it does not have the special features for storing ammunition and explosives. An igloo (fig 1-7) is a magazine used for the storage of ammunition and high explosives. It is generally constructed of masonry with an arched roof covered with earth. The igloo must be well ventilated but not heated. The temperature in igloos will generally average from 40° to 45° F in the winter and from 60° to 70° F in the summer. The typical igloo has one or more doors in the front of the building; there are no other doors in the igloo. There are no carloading facilities nearby because the nature of the items stored demands that igloos be scattered widely throughout a comparatively isolated area. Although the arched roof of the igloo limits storage height, it provides an added feature in event an explosion should occur. The highest point of the arch, being the weakest point, would collapse first; consequently, the destructiveness of the explosion would be lessened. Because igloos are constructed in isolated locations, the use of materials handling equipment is limited. Much of the stacking is done manually because there are no operating aisles for materials handling equipment.

Fig 1-6. Aboveground magazine.

Fig 1-7. Typical igloo.

1-6. SPACE PLANNING

The availability of storage is limited and sometimes critical. "Storage space" is that space designed or used for the storage of materials, equipment, or supplies. It cannot be had just for the asking, but is obtained from higher authority on the basis of a defendable need. Space must be conserved and used to the fullest extent. As the quantity of supplies to be stored grows larger, the demand on storage space becomes greater. This demand must be met by careful planning and efficient space layout. Space planning has the following fundamental objectives:

a. Full use of space. Every foot of storage space must be used to the fullest extent, not only horizontally but also vertically.

b. Saving of time and labor. Heavy and unexpected shipments can be made by fewer men in less time when supplies are properly stored. The shortage of workers and time makes every man or woman and every minute valuable. Therefore, both workers and time should be used wisely.

c. Accessibility of stored supplies. It does little good to store supplies if they are not accessible (not easily approached) when they are needed. The location of each stored item must be known, and each item must be readily accessible. There are several factors to consider in relation to accessibility; the most important of these are doors and aisles, which influence the entire warehouse layout. Rows and the direction of storage must also be considered in making supplies accessible.

(1) Doors. The position of doors influences the method of aisle arrangement. Doors must offer ready passage, yet they must not waste space by being wider than necessary. Too many doors waste space; too few doors slow the operation. Doors provide straight-line flow of supplies, minimize the number of turns necessary, and allow entrance and exit to warehouses. Doors not being used should be blocked and marked " THIS DOOR BLOCKED".

(2) Aisles. Aisles and doors are closely related because one furnishes ready access to the other. Whenever possible, aisles should be laid out according to the location of the doors because doors are permanent. Factors to consider in laying out aisles include; distance to doors and loading platforms, location of firewalls, location and size of columns, and the size and turning radius of forklift trucks to be used. Turnaround space for materials handling equipment determines aisle widths. For example, forklift trucks of 2,000-pound capacity operate satisfactorily in 8-foot aisles; 3,000- to 4,000-pound capacity, in 10-foot aisles; and 6,000-pound capacity, in 12- to 14-foot aisles. The width of aisles may be held down if the lightest possible materials handling equipment is used. Aisles furnish access to each item in storage. Once aisles have been established, aisle lines should be painted on the warehouse floor.

(a) Main aisles. Main aisles are the primary highways of the warehouse and extend through the entire length of the building. They must be wide enough to permit easy passing of two loaded pieces of materials handling equipment going in opposite directions. Main aisles of 10-foot width, accommodating a 4,000-pound capacity forklift truck, are ample for the average warehouse.

(b) Cross aisles. Cross aisles run across the warehouse and connect the main aisles. Whenever possible, cross aisles should lead directly through the doors opening onto the loading platforms. It is desirable to have nine or ten foot widths for the cross aisles, depending on the operation and the size of the equipment being used.

(c) Service aisles. Service aisles are used to divide additional storage area when short areas adjoining main aisles are not sufficient for the storage of small lots. Service aisles are narrow passageways, for moving supplies to and from the stack. Service aisles should not be used unless absolutely necessary.

(d) Bin aisles. Bin aisles, which are a minimum of thirty inches wide, run between bin sections. They furnish access for stock picking and replenishment. Main aisles in bin areas ordinarily do not exceed ten feet in width.

(3) Rows. In order to provide sufficient flexibility for the warehousing of stock under changing conditions, aisles numbers are provided for the entire station area, including all aisle space except fire aisles. By the use of this method, numbers in the proper sequence are available if it becomes necessary to use aisle for storage purposes. A row is 52" wide running in a straight line the width or length of the station. The grid layout of rows furnishes a uniform identification of each individual storing location. The establishment of aisles involves the use of a floor plan, or planograph.

(4) Direction of storage. The direction of storage must also be considered in relation to accessibility of supplies in storage (fig 1-8). The direction of storage is the direction that the supplies are removed from stock. In determining the direction of storage, you must consider the distance that the supplies will have to be hauled and the use of materials handling equipment.

(a) Whenever possible, supplies in large lots should be stored with access to cross aisles. Then by spotting the car or truck at a specific door, only one turn by the materials handling equipment is necessary in hauling to and from the platforms.

(b) Supplies are stored from walls to aisles in end bays. In center storage areas bounded by aisles, the area is divided by imaginary lines to provide greater accessibility to supplies and to prevent the depth of storage from becoming too great.

(c) Small and medium lots of supplies (defined later in para 1-7a) are stored along the edge of main aisles, and at odd places throughout the warehouse. Depending on the quantity of supplies and available space, they may be palletized one or two storage stacks in depth or width.

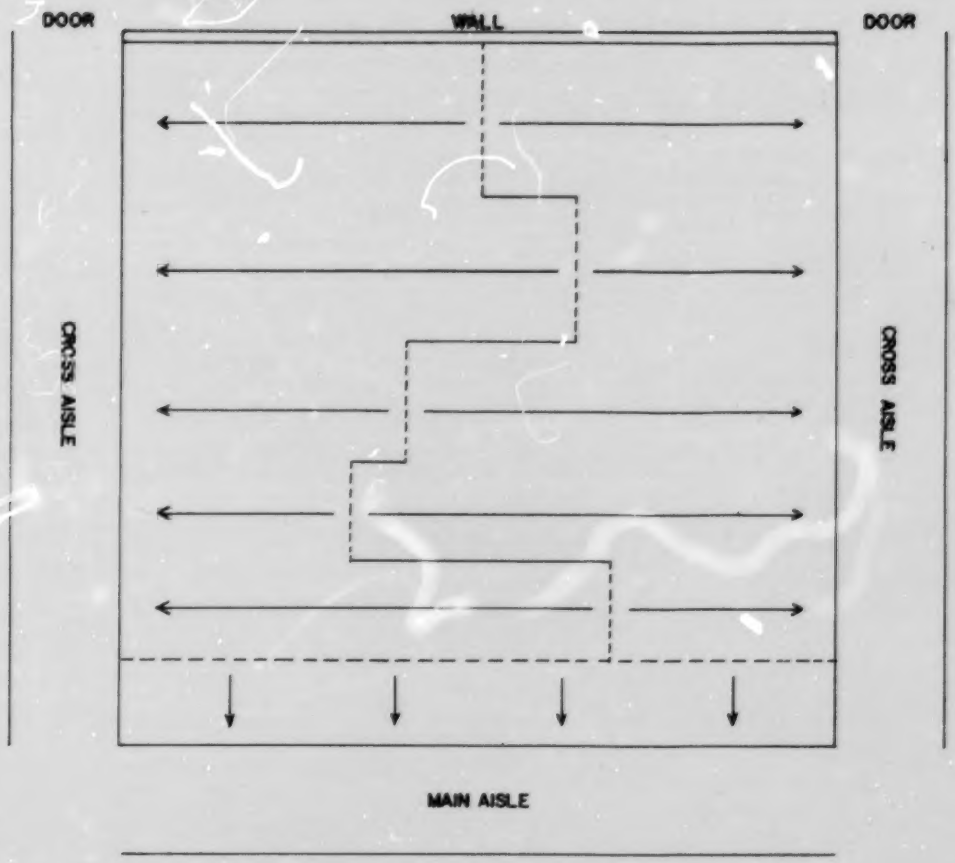

Fig 1-8. Varying the depth and direction of storage.

d. Protection of stored supplies. Some supplies must be protected against weather; others, against extremes in temperature. Some must be kept away from odors; some must be protected from light; and all must be protected against fire. The protection of supplies is always an important consideration in space planning.

1-7. PLANOGRAPH

The planograph, a warehouse floor plan drawn to scale, is an excellent tool for maintaining space control. It is the basic source of space information. It enables storage personnel to plan for the effective use of space at the most logical place, in the storage area itself. A complete and currently maintained planograph shows the actual manner in which the gross storage space within the warehouse is used. A combination of large, medium, and small lots is stored in the same bulk storage area. By this practice, you can accommodate items of one Federal group which may vary in volume and physical size. Bulk stock in the Marine Corps does not include retail-bin storage sections. Most storage activities have their bin storage section in one area (in one or more warehouses), and most general purpose warehouses are used for bulk storage only. The preparation of a warehouse planograph is the responsibility of the space utilization officer of the supply activity. You should find a planograph posted in a conspicuous place in the warehouse (such as near the bulletin board). A planograph consists of two related features; the basic drawing, which illustrates permanent or semi-permanent features within the warehouse, and a transparent overlay placed on the basic drawing for use in recording day-to-day changes of space availability.

a. Basic drawing of the planograph. The basic drawing of a good planograph should show the following information:

(1) The actual layout of space. Includes offices, heads, boiler rooms, assembly areas, firewalls, doors, columns (posts), aisles, and storage blocks. The square feet of space used for storage and for working aisles should be shown to aid in space planning and materials handling operations.

(2) Floor markings. These designate the different types of storage and should be indicated as follows (refer to fig 1-9).

(a) Large-lot storage. The perimeter line, divided into equal segments by width marks, is used to indicate supplies stored in large-lots.

(b) Medium-lot storage. In addition to the markings used for large-lot storage, broken lines are used to indicate grids in medium-lot storage. A medium-lot is a quantity of material requiring one to three pallet stacks, stacked to a maximum height.

(c) Small-space storage. Solid lines are used to indicate grids on which small lots are placed. A small-lot is a quantity of material less than a complete pallet stack.

(d) Retail-bin storage. Solid lines are used to indicate bin shelving sections and bin rows.

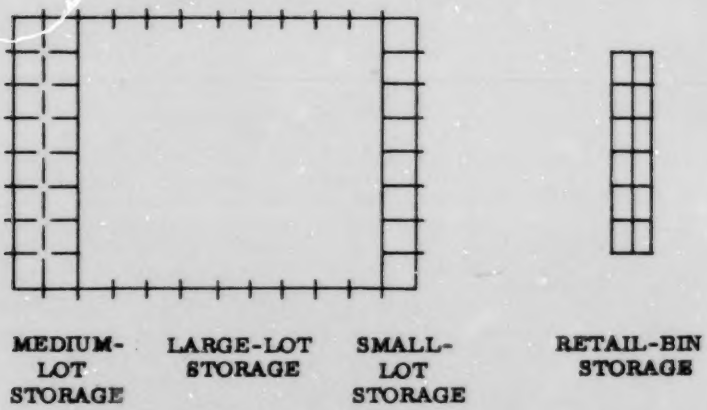

Fig 1-9. Types of floor markings shown on a planograph.

(3) Row numbers. Should be entered along aisles for the purpose of stock location.

(4) The stock location warehouse code number. This will be a two-digit number if used. All warehouses with more or less than two-digit numbers will be assigned a two digit code number for stock location, and this code number should be indicated in the legend of the planograph.

(5) The planograph scale (commonly 1/16th of an inch represents one foot) should be indicated in the legend.

(6) Stacking heights. The maximum heights permitted should be indicated.

(7) The floorload rating. The maximum weight permitted per square foot of floor space should be indicated in the legend.

(8) Door numbers. These numbers should be shown and the legend should indicate the width and height of the doors.

(9) Fire extinguisher locations. Should include the fire post number if used. This information may be indicated as follows:

13
HOSE

From this information, the warehouseman knows where fire station 13 is located and that the station is a fire hose.

(10) Direction of storage arrows. Should be used to indicate the direction of storage for large and medium lots. It may be more desirable to place this information on the acetate overlay rather than on the planograph.

b. The planograph overlay. If a planograph contains the information listed above, it is ready for your use in controlling space. Before the planograph is used, it should be covered with acetate so that markings may be made with a grease pencil, thus permitting the updating of information which changes from day to day. The following information should be included on the acetate overlay of a planograph:

(1) Vacant space in bulk storage may be shown by shaded areas. By this method, you can readily determine where incoming supplies may be stored.

(2) The overlay may also be marked to show where the various Federal groups are stored. By using colored grease pencils, you can show such potential vacant space as partially emptied rows or full stacking heights not utilized. With this information, you know where additional space can be recovered in an emergency and where stock may be repositioned during slack periods.

(3) To illustrate pallet racks and bin sections, the overlay may be marked to show the number of openings available on a location or in a row.

c. Use of planographs. As you can see, there are many practical uses for the planograph as a working tool in the day to day operation of a warehouse.

1-8. STOCK LAYOUT

Stock layout is simply the drawing of receiving, shipping, and packing areas; retail bins; pallet racks; and small, medium, and large lot storage space on a floor plan of the entire storage area. A floor plan is simply a drawing of the warehouse floor or any other storage surface. You should achieve a maximum storage capability and still have the flexibility to handle unexpected receipts. When retail bins are installed in a storage area, you lose much of the flexibility because of their limited storage capacities and their fixed position but gain greater use of storage space in bulk storage by eliminating partially filled containers and some very small lots of items. Several factors are considered in determining the stock layout for bulk storage; the type of supplies or commodity to be stored, the capacity of storage areas, and the capabilities of materials handling equipment.

a. Commodity factors. Commodity factors concern the supplies. The planning and layout of space must be coordinated with the type of supplies which are anticipated for storage. Suitable storage space must be provided near doors and loading points for active fast moving supplies. Supplies in large quantities should be stored in the large blocks of space provided in the center or end of sections. Small quantities, however, can go in several places throughout the storage area. The size, weight, and shape of supplies must be considered in space planning so that heavy or bulky supplies will be transported the shortest distance possible between stack and loading point. The nature of the materials to be stored must also be considered. Some supplies must be kept dry; some must be stored away from odors; others must be protected from light and temperature variations. Highly pilferable items, security items, and hazardous commodities must be given special storage consideration. Space must be planned so that supplies which need special consideration are given proper storage.

b. Capacity factors. Capacity factors concern the storage area itself, that is, its physical characteristics, the use of floor or ground area, and the use of space from the ground upward.

(1) Physical characteristics of the storage area. Space must be laid out in accordance with certain physical characteristics of the storage area. These characteristics, along with the characteristics of the items, will determine how storage space can best be used. For example, space planning requires consideration of the location, number, and size of warehouse doors; location of lights, lighting circuits and switches; condition of the flooring and its floorload rating; height of ceilings or overhead obstructions throughout the warehouse; the type, location, and capacity of elevators, ramps, and chutes; and the location of water outlets and firefighting equipment.

(2) Use of horizontal area. On the basis of the physical characteristics of the storage area, the warehouseman must plan his stock layout so that every foot of floor or ground space is used. It is true that not every foot of floor or

ground space can be used for storage. Offices, washrooms, receiving and issuing space, packing rooms, and aisles are all necessary; however, the space they occupy must be kept to a minimum.

(3) Use of vertical space. In laying out storage space, you must visualize it in terms of vertical storage space (figs 1-10 and 1-11) from the floor or ground up, as well as in terms of horizontal space.

NOTE: The total net square feet of storage space required for a 40- x 48-inch pallet, including the operating losses, is 16 square feet.

Fig 1-10. Proper use of vertical space for storing small lots.

BUILD STACKS HIGH
...utilize vertical space to the fullest extent...save floor space for additional receipts.
YOU GET HIGH STACKS BY...
Using box pallets if the individual containers are weak.
Lifting two pallets at once to the top of the stack.
Increasing or decreasing the height of the individual pallet load.

Fig 1-11. Proper use of vertical space.

c. Size of storage blocks. The floor area of individual storage blocks is limited to 2,000-square feet for hazardous materials and to 8,000-square feet for moderate and low combustible material. There is no limit on noncombustible materials.

d. Height of stacks. The height of stacks should not be limited except as may be required to prevent damage to certain supplies and to maintain clearances. The height of the stack below automatic sprinkler deflectors (fig 1-12) has certain limitations. When, for instance, the stack height does not exceed 15feet, an 18-inch clearance is required. When the stack height exceeds 15 feet, a 36-inch clearance is required. On the other hand, hazardous commodities require a 36-inch clearance, regardless of stack height. A limitation has also been placed on the height to which supplies may be stacked below joists, rafters, beams, and roof trusses. When stack heights exceed 15 feet, a 36-inch clearance is required. In buildings without sprinkler systems, a 36-inch clearance is required regardless of stack height. Around light or heating fixtures, an 18-inch clearance is maintained above stacks. When supplies are stacked above the horizontal level of lower roof truss members or beams, a horizontal clearance of 18 inches must be allowed between supplies and structural members or other installed devices.

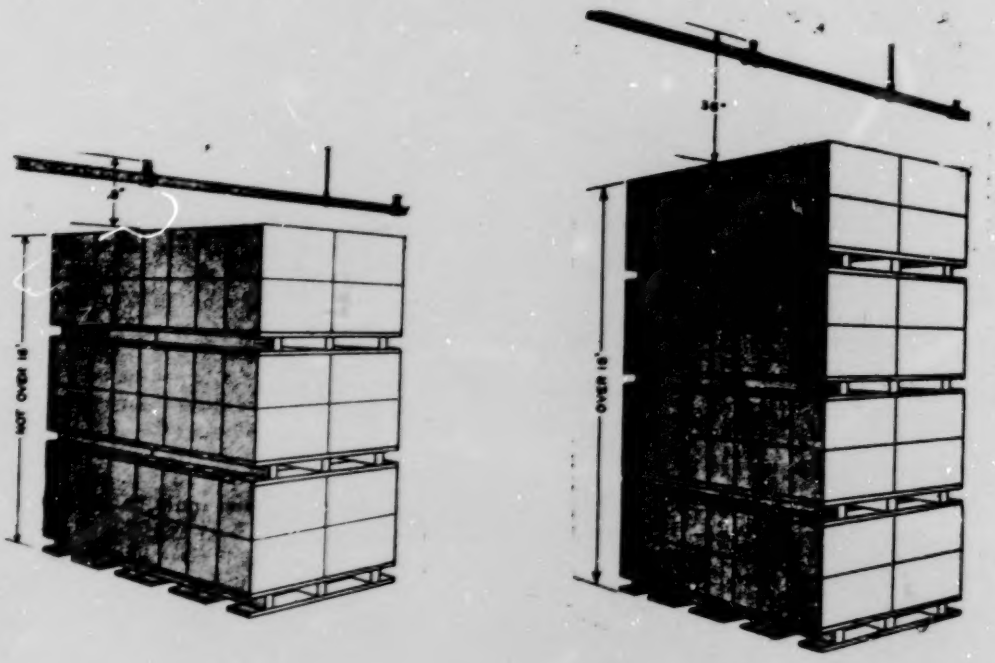

Fig 1-12. Overhead stack clearance at sprinkler head.

e. Clearances. Ordinarily, clearances between stored materials and walls are not required. In some specific instances, however, they are important and must be maintained (see figs 1-13 through 1-16). A 24-inch clearance must be maintained between stored materials and substandard firewalls. A substandard firewall has a fire resistance rating of less than four hours. When hazardous materials are stored in general purpose warehouses, a 24-inch wall clearance is required. In addition to these wall clearances, certain others are also maintained. When, for instance, clearances are necessary to maintain storage block limitations because the supplies are hazardous or combustible, clearances between stacks are not more than four feet in width for 2,000-square-foot blocks, or six feet for 8,000-square-foot blocks. A 24-inch clearance must be maintained around the path of travel of fire doors. Materials are not stored within 36 inches of a fire door opening.

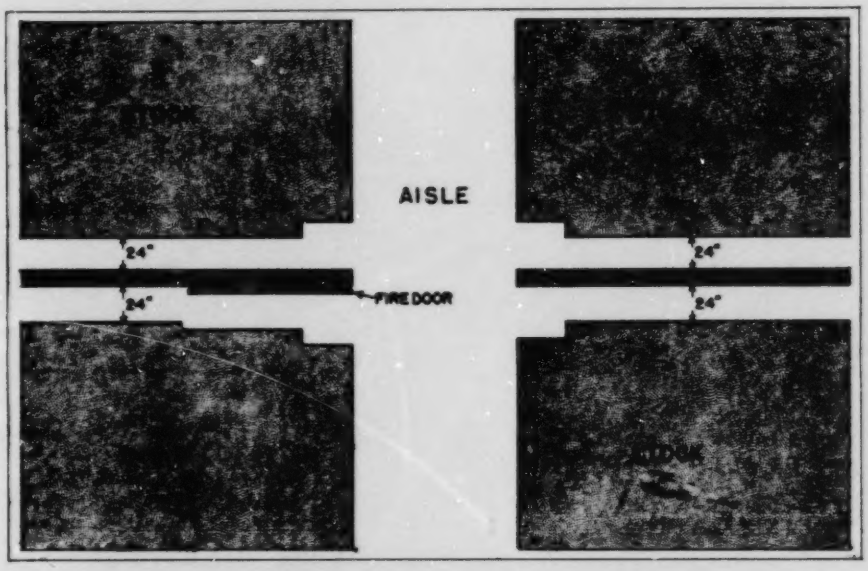

Fig 1-13. Stack clearance at substandard firewalls.

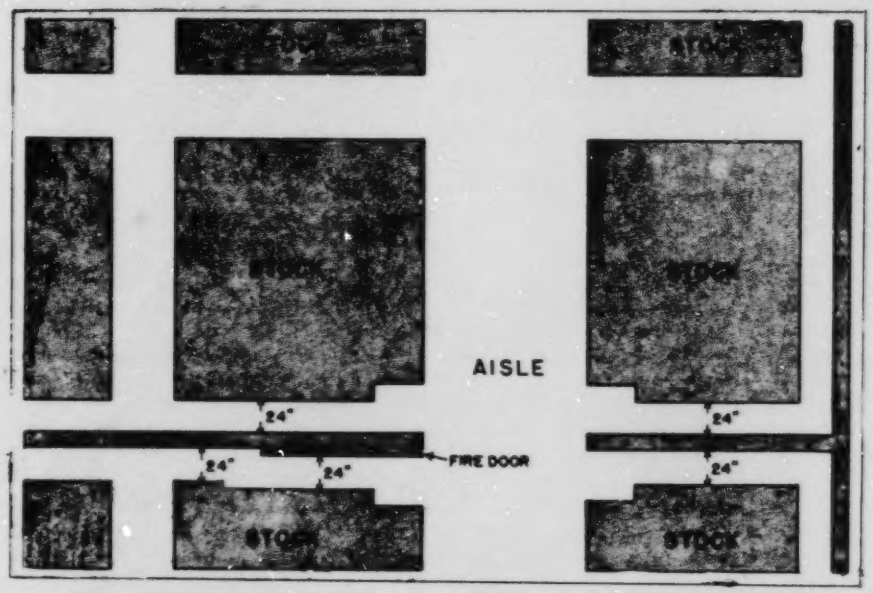

Fig 1-14. Stack clearance for hazardous materials.

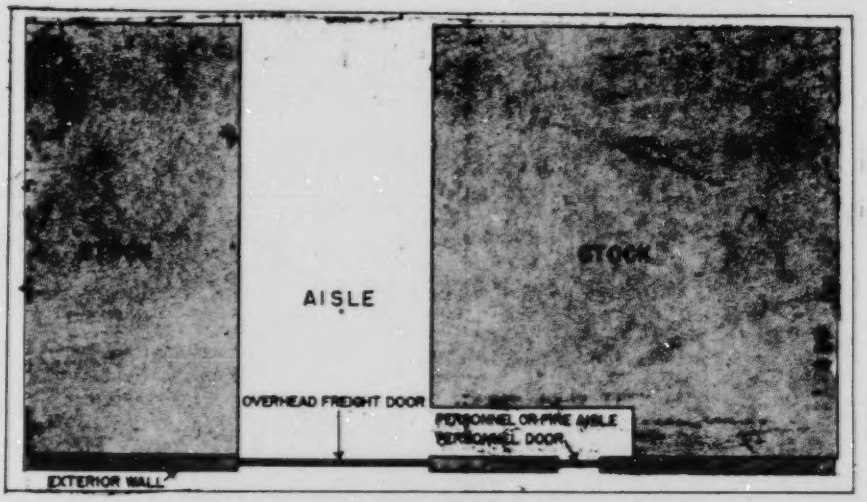

Fig 1-15. Stack clearance at exterior walls (nonhazardous materials).

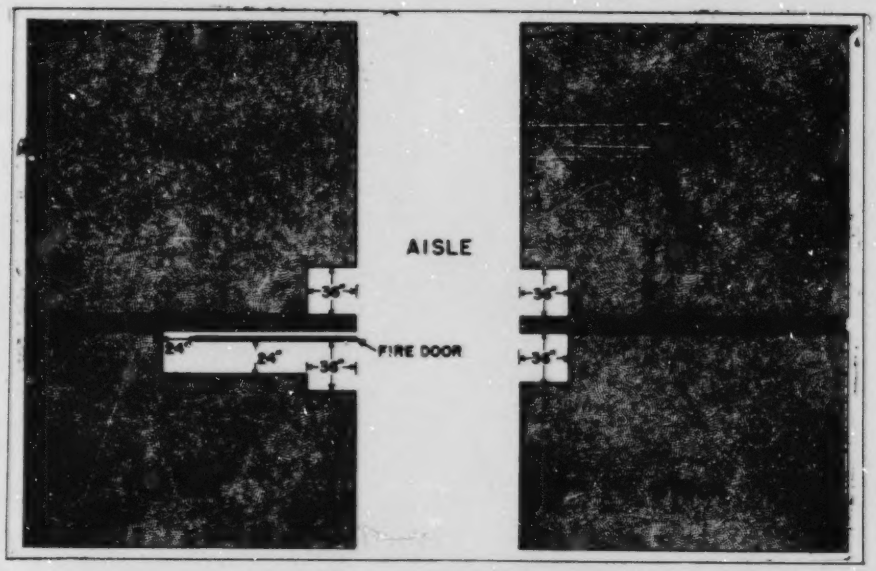

Fig 1-16. Stack clearance at standard firewalls and at fire doors.

1-9. SQUARE, CUBE, AND WEIGHT COMPUTATIONS

To use storage space most effectively, you must be able to compute square and cube requirements and weight capacities of storage areas. This paragraph presents formulas for computing the square and cube of a container or area, as well as methous of computing weight limitations in a storage area.

a. Square and cube computations

(1) Computing square feet. To find the square feet an item will occupy, use the formula, length (L) x width (W) = square (S). The answer is normally expressed in square feet. The "square" of an item tells you how much horizontal space, or floor space, the item occupies. When you use the formula L x W = S, express both the length and width in the same unit of measure, such as feet or inches. You cannot multiply feet times inches and get the square of an item. The symbol ' when used with a number indicates feet and " indicates inches; thus 6' equals six feet and 6" equals six inches. The following are examples of square feet computation:

(a) Examples of figuring square:

1. A crate is 12' long x 8' wide x 6' high. How many square feet will this crate occupy?

12'
x8'
96 square feet (height is not used for finding the square of an item)

2. A box is 2' long x 15" wide x 18" high. How many square feet of space will this box occupy? You cannot multiply 2' x 15" so either convert the feet to inches or the inches to feet before you multiply. It is better to convert to feet, because when you get your answer it will be in square feet. If you multiply inches by inches, you must then convert your answer to feet.

TWO METHODS TO OBTAIN SQUARE FEET

a. First convert 15" to feet; 15" is equal to 1.25 feet or 1-3/12 = 1-1/4'

1.25' W
x 2' L
2.50 square feet

or

2' x 1-1/4' =

$\frac{2}{1} \times \frac{5}{4} = \frac{10}{4}$ = 2-1/2 square feet

How many square feet of space is occupied by an area 104" W x 208" L? Remember to first convert the inches to feet.

17.33' L
x 8.67' W
12131
10398
13864
150.2511 or

150.3 square feet

8-2/3' x 17-1/3' =

$\frac{26}{3} \times \frac{52}{3} = \frac{1352}{9}$ = 150-2/9 square feet

b. There may be instances when it will be easier to compute square feet by using inches instead of converting to feet. The following example illustrates the steps to be taken. You must remember that there are 144 square inches in one square foot (12" x 12" = 144 square inches).

A box is 7" long, 5" wide, and 3" high. How many square feet will it occupy?

7" L
x5" W
35 square inches

.243 square feet
144 735.000
28 8
6 20
5 76
440
432

(2) Computing cubic feet. To find the cubic feet of space an item will occupy, use the formula length (L) x width (W) x height (H) = cube. The answer is normally expressed in cubic feet. The "cube" of an item will give you a 3-dimensional picture of the amount of air space that an item will require. When figuring cube, you must express the length, width, and height in the same unit of measure, such as feet or inches. It is faster to figure by feet. The following are examples of figuring cube:

(a) A crate is 12' long x 8' wide x 6' high. How many cubic feet will this crate occupy?

12' L
x 8' W
96 square feet
x 6' H
576 cubic feet of space occupied by the crate

(b) In an earlier problem, you found that the square feet of an area was 104" W x 208" L, or 150.3 square feet. If you can stack to 16' in height, what is the cube of this area?

150.3 square feet
x 16' H
9018
1503
2404.8 cubic feet of space

(c) If you should have to compute cubic inches or to convert cubic inches into cubic feet, follow the example shown below. Remember that there are 1,728 cubic inches in a cubic foot (12" x 12" x 12" = 1728 cubic inches). A box is 24" long x 15" wide x 18" high. How many cubic inches will this box occupy?

24" L
x15" W
120
24
360 square inches
x 18" H
2880
360
6480 cubic inches

3.75 cubic feet
1728/6480.00
5184
1296 0
1209 6
86 40
86 40

NOTE: When marking boxes in the Marine Corps, indicate the cubic feet on the box to the nearest 1/10th of a cubic foot. Thus, this box would be marked 3.8 cubic feet.

b. Weight computations

(1) Method of weight computation. Earlier we mentioned the floor load rating as a capacity factor which limits the use of vertical space. The floorload rating should never be exceeded because it could cause damage to the structure and to the supplies stored therein. In most of our modern warehouses, weight will not usually be a limiting factor; however, you should always consider this factor. The floor load rating is expressed in pounds per square foot. To find out how much an area will support, find the square feet of the area and multiply by the floor load rating. A good formula to remember is S x R = C (square x rating = capacity).

(2) Examples of weight computations

(a) In an earlier problem, you found that a certain area contained 150.3 square feet of space. If the floorload rating is 600 pounds per square foot, how much weight can be placed in this area?

150.3 square feet
x 600 pounds per square foot rating
90,180.0 pounds can be placed in this area

If you determine that an incoming shipment will fit in this area so far as cube is concerned, check the weight of the shipment to see if the floorload rating of the area is sufficient for the shipment.

(b) You want to stack four unit loads into one pallet stack. Each unit load weighs 3,980 pounds and is 4' L x 4' W. The floor load rating is 600 pounds per square foot. Would the floor load rating be exceeded by this pallet stack?

3980 pounds per unit load	4' length of load
x 4 unit loads	x4' width of load
15920 pounds (weight of proposed pallet stack)	16 sq ft occupied by pallet stack

16	square feet occupied by pallet stack
x 600	pounds per square foot rating
9600	pounds of weight this floor area will support

In this case, the stack would weigh 15,920 pounds while the floor will support only 9,600 pounds. Thus, all the vertical space cannot be used because of the weight limitation. There will have to be two pallet stacks, each two loads high.

1-10. SAFETY IN STORAGE

a. Unsafe conditions. Safety and accident prevention is the responsibility of everyone, and should be made an intregal part of any storage operation. Most accidents are "manmade", caused by unsafe acts of individuals or unsafe conditions which they allow to exist. When a person is taught the right way to do something, it is impossible not to teach him/her the safe way. Because this is so true, safety is often taught as part of other instructions. The Storage and Materials Handling Manual (DOD 4145.19-R-1) explains in detail the rules for safe storage that all personnel should become familiar with. Listed below is a representative list of the rules most often disregarded, thus causing accidents.

(1) All materials, whether palletized or unpalletized, should be placed and secured in a safe manner.

(2) All pallet loads should be squared to achieve a four-point level top. A four-point load is one which provides four points of contact, level with each other at the top, at or near the four sides of the pallet.

(3) Partially loaded pallets should be stored in pallet racks or at tops of stacks.

(4) When stacked vertically, loads with cylinders of compressed gas should be strapped and collared.

(5) Broken or damaged pallets should be replaced with pallets in safe condition.

(6) Sufficient dunnage should be used when stacking heavy materials in open storage on muddy or soft ground or on asphalt type paved surfaces in hot weather to preclude later tipping or settling of such material.

(7) Noncapped or nonstrapped stacks of lumber or empty drums in open storage should be tied to prevent top units from being blown off.

(8) Pallet loads should be stacked with two inches of clearance on all sides to prevent dislocation of adjacent units.

(9) Crushable containers should have vertical supports placed in such a manner that weight of material stored above will not be supported entirely by the containers.

(10) Cylindrical units stored in horizontal position should be blocked, nested, or separated by notched horizontal spacers.

(11) Always use warehouse corner markers at corners of stacks and at aisle intersections.

(12) Loose straps and protruding nails should be removed, repaired or pounded level on all boxes and unit loads in storage to prevent future injury to personnel handling.

(13) Closed containers should be provide for storing flammable packing materials such as paper, scrap, and excelsior.

(14) Keep aisles and exits clear at all times.

(15) Keep the warehouse clean. The chief cause of fire is poor housekeeping.

(16) Adequate lighting in storage areas decreases the hazard of accidents and contributes to workers' health and morale. Adequate lighting in working areas and traveled spaces must be maintained at all times.

(17) Under special conditions, certain materials generate enough heat to ignite spontaneously. Oils, lubricants, and fats when absorbed by fibrous materials such as rags, waste, and paper are particularly dangerous. To combat combustion, proper ventilation should be provided at all times. Spontaneously combustible materials should be segregated from each other and from other flammable materials.

b. Fire protection. Fire is one of the major hazards of storage operations. The best protection against fire is prevention! Once a fire has started in a warehouse, it is impossible to avoid damage to supplies from flame, smoke, extinguishers, or all three.

(1) Triangle of fire. There are three elements in any fire: material, heat, and oxygen. This is commonly referred to as the "triangle of fire". No fire can exist without all three elements. Therefore, the purpose of firefighting equipment is to remove the heat and/or oxygen. Listed below are the classes of fire, the element to remove, and the type of extinguisher to use.

CLASS	NAME	ELEMENT TO REMOVE	EXTINGUISHER TO USE
A	wood, paper trash etc. A deep-seated fire	heat	water or soda acid
B	flammable liquid	oxygen (smother)	CO_2, dry chemical, or foam
C	electrical	oxygen (smother)	CO_2 or dry chemical

(2) Special precautions. Smoking regulations must be observed in and around all storage areas. Smoking should be permitted only in approved smoking areas. Fire drills should be conducted periodically to educate storage personnel in their duties during an emergency.

Section II. MARINE CORPS DISTRIBUTION SYSTEM/MOWASP

1-11. THE MARINE CORPS DISTRIBUTION SYSTEM

The Marine Corps Distribution System comprises all actions required in the acquisition, availability, and disposal of material assets of the Marine Corps. Total system responsiveness requires contributions by elements of Headquarters Marine Corps, the ICP, direct support stock control (DSSC) activities, and the Marine Corps Logistic Bases (MCLB's).

1-12. MECHANIZATION OF WAREHOUSING AND SHIPMENT PROCESSING (MOWASP) (SUBSYSTEM 06)

a. Subsystem 06, Mechanization of Warehousing and Shipment Processing (MOWASP), pertains to warehousing and to you. This subsystem, MOWASP, under MUMMS, prescribes the standard procedures for processing transactions between the Marine Corps Inventory Control Point (ICP) and the Marine Corps Logistics Bases (MCLB's). This system is designed to achieve maximum standardization of transaction processing between activities, and to simplify warehousing operations by eliminating unnecessary manual systems. Some of its key features are:

(1) Data processing area. Includes random access with a remote inquiry capability to obtain location and shipping data, construction of shipment and transportation units within the computer to achieve maximum freight consolidation, the printing of shipping documents from computer files, and preparation of management tools, including the shipment workload forecast, warehouse workload summary, management report on the status of end items being processed for shipment, and new item receipt notices. Under MOWASP, the item identification of all items stored at an MCLB is on file at the ICP.

(2) Transportation area. Tonnage distribution by carrier is recorded in the computer to ensure equal distribution among carriers. Items to be released from the repair function appear on the shipment planning forecast to facilitate shipment.

(3) Receipt area. The ICP and Defense Logistics Agency (DLA) provide the MCLB's with the prepositioned material receipt data which can be loaded in the computer. The MCLB's then key this data into their remote equipment and obtain automated output of the planned locations. Concurrent with the program, the computer prepares a material receipt confirmation for transmission to the ICP.

(4) Issue area. Items requiring special handling are controlled throughout the issue process by the computer. Bin replenishment is an automated procedure.

(5) Care-in-store area. The care-in-store program is computer scheduled, using a sampling technique. Shelf-life items are computer controlled. Operational surveillance inspection is integrated with the packing and preservation surveillance program. Items which have a constant turnover are excluded from any inspection criteria. The exclusion is determined through the use of issue histories and stock level requirements and is built into the computer program.

(6) Inventory area. The inventory program is based on location verification, a complete check of stock denials, and the establishment of a system error file to determine the cause of stock denials. As long as the stock denial rate is within satisfactory limitations, location verification on a statistical sampling basis is the primary requirement of the physical inventory program. This principle of management by exception prevails throughout MOWASP with special attention to known problem areas.

b. The MOWASP subsystem does not eliminate manual handling of material within the warehouse proper. For a more complete understanding of the MOWASP subsystem a review of MCO P4400.75__ is recommended. That order gives a complete picture of all facets of the computer, flow charts, and demands placed upon the system.

BASIC WAREHOUSING

Lesson 1

Introduction to Storage

STUDY ASSIGNMENT: Information for MCI Students.
Course Introduction.
MCI 30.1k, Basic Warehousing, Chap 1.

LESSON OBJECTIVE: To acquaint you with warehousing publications and the storage mission of Marine Corps activities; to teach you the general appearance and basic functional use of the most common storage facilities, principles of effective use of warehouse space, and basic rules for safety and fire prevention.

WRITTEN ASSIGNMENT:

A. Multiple choice: Select the ONE answer which BEST completes the statement or answers the question. After the corresponding item on the answer sheet, blacken the appropriate circle.

Value: 1 point each

1. Where can you find an on-the-job training course for storage personnel?

   a. DOD 4145.19-R-1
   b. NAVMC 1144
   c. MCO 2740.1C
   d. MCBul 5215

2. The basic warehousing manual used by the Department of Defense is

   a. NAVMC 1090.
   b. DOD 4145.19-R-1
   c. MCO 2740.1C
   d. NAVMC 1175

3. Which Marine Corps bulletin lists all effective Marine Corps directives?

   a. 5605
   b. 5210
   c. 5215
   d. 5225

4. Most storage in the Marine Corps can be described as _____storage.

   a. active
   b. nontemporary
   c. temporary
   d. permanent

5. The activity with the storage mission at Albany, Georgia, is a

   a. forwarding depot.
   b. force service support group
   c. service battalion.
   d. Marine Corps Logistics Base.

6. In garrison a force service support group maintains which type of supplies?

   a. Stock for using units in garrison
   b. Garrison supplies only
   c. Garrison and mount-out stocks for a division/wing task force
   d. All classes of supply except for day-to-day housekeeping supplies

7. Infantry battalions submit their requisitions to the

   a. Marine Corps Logistic Base.
   b. SMU.
   c. Base Material Battalion.
   d. Inventory Control Point.

8. A Marine air wing is furnished which items by the Marine Corps?

   a. Spare parts for airplanes
   b. Fuels and lubricants
   c. Air craft radios
   d. Tents

9. In the Marine Corps, the most common type of covered space is the _____ warehouse.

   a. flammable storage
   b. refrigerated
   c. controlled humidity
   d. general purpose

10. Which advantage is gained in storing items in a single-story warehouse, rather than in a multistory warehouse?

a. Less ground space is needed for construction.
b. More horizontal space is available for storage.
c. All operations are on one level.
d. More vertical space is available for storage.

11. Items which do not require special attention should be stored in a _____ warehouse.

a. flammable storage
b. refrigerated
c. controlled humidity
d. general purpose

12. A roofed structure that is partially enclosed is called a(an)

a. general purpose warehouse.
b. igloo.
c. shed
d. magazine

13. Materials which need protection from the weather, but not from the temperature or humidity changes, should be stored in a(an)

a. shed
b. igloo
c. general purpose warehouse
d. controlled humidity warehouse

14. Who determines whether a specific item must be stored in an open storage area?

a. Warehouseman receiving the item
b. Storage officer
c. Space utilization officer
d. Property control officer

15. Access to each item in storage is provided by

a. aisles.
b. pallet racks.
c. materials handling equipment.
d. platforms.

16. The general purpose warehouse is divided into sections by

a. main aisles.
b. cross aisles.
c. aisles and walls.
d. firewalls.

17. In a general purpose warehouse, sections are divided into storage bays by

a. aisles.
b. columns.
c. firewalls.
d. imaginary lines.

18. In a general purpose warehouse, which aisles furnish access to loading platforms?

a. Transportation aisles
b. Main aisles
c. Fire aisles
d. Cross aisles

19. In which type of warehouse do aisles run the entire length of the building?

a. Flammable storage warehouse
b. General purpose warehouse
c. Magazine
d. Refrigerated warehouse

20. Which is the most acceptable warehouse to convert to a controlled humidity warehouse?

a. Flammable storage warehouse
b. General purpose warehouse
c. Refrigerated warehouse
d. Magazine

21. Electrical items that are difficult to preserve should be stored in a _____ warehouse.

a. flammable storage
b. general purpose
c. controlled humidity
d. refrigerated

22. In a refrigerated warehouse, the temperature of chill storage space can be controlled between

a. 0^{0} to 20^{0} F.
b. 20^{0} to 32^{0} F.
c. 32^{0} to 50^{0} F.
d. 50^{0} to 70^{0} F.

23. Paint should be stored in a _____ warehouse.

a. refrigerated
b. flammable storage
c. general purpose
d. controlled humidity

24. Which item should be stored in an igloo?

a. Paint
b. Oil
c. Compressed gas
d. Explosives

25. To lessen the danger of an explosion, aboveground magazines should be

a. built of fireproof materials.
b. heated.
c. refrigerated.
d. sealed airtight.

26. Supply stores should be accessible from a(an)

a. aisle.
b. segment.
c. service lane.
d. fire lane.

27. A warehouse row is how many inches wide?

a. 30
b. 42
c. 48
d. 52

28. Which part of the warehouse floor is NOT assigned aisle row numbers?

a. Main aisles
b. Cross aisles
c. Fire aisles
d. Service aisles

29. The minimum width of a bin aisle is _____ inches.

a. 24
b. 30
c. 36
d. 42

30. If a 4,000 pound capacity forklift is used in a warehouse, how wide should the aisles be?

a. 8 ft
b. 10 ft
c. 12 ft
d. 14 ft

31. The direction of storage is the direction that material is

a. loaded into a storage block.
b. routed through the warehouse.
c. placed into storage.
d. removed from stock.

32. Which aisles should provide access to supplies in large lot storage?

a. Service aisles
b. Main aisles
c. Fire walls
d. Cross aisles

33. All supplies in storage must be protected from

a. weather.
b. heat.
c. odors.
d. fire.

34. The basic drawing of the planograph shows the

a. permanent or semi-permanent features within the warehouse.
b. day-to-day changes of space availability.
c. areas where each Federal group is stored.
d. location of potential vacant space.

35. The planograph overlay is used to indicate the

a. actual layout of space.
b. floor markings for large, medium, and small lot storage.
c. day-to-day changes of space availability.
d. bin shelving sections and bin rows.

36. When the quantity of an item received is sufficient for two pallet stacks, you should store the item in _____ storage.

a. retail bin
b. small lot
c. medium lot
d. large lot

37. What is the maximum amount of space allowed in a storage block (bay) containing moderately combustible items?

a. 2,500 sq ft
b. 4,000 sq ft
c. 6,000 sq ft
d. 8,000 sq ft

38. The required clearance between the path a fire door travels and stacked supplies is

a. 12 in.
b. 18 in.
c. 24 in.
d. 36 in.

39. When hazardous materials are stored in a general purpose warehouse what wall clearance is required?

a. 12 in.
b. 24 in.
c. 36 in.
d. 48 in.

40. What is the clearance required between stacked supplies and a fire door opening?

a. 12 in.
b. 18 in.
c. 24 in.
d. 36 in.

41. If a crate is 5'-6" long x 2'-6" wide x 3'-6" high, how many square feet will it occupy?

a. 13.75 sq ft
b. 19.80 sq ft
c. 27.72 sq ft
d. 48.13 sq ft

42. If a storage area is 52" wide x 156" deep, how many square feet will this area occupy?

a. 12.9 sq ft
b. 13.0 sq ft
c. 56.3 sq ft
d. 81.1 sq ft

43. A crate is 11'-6" long x 4'-6" wide x 6'-8" high. How many cubic feet will this crate occupy?

a. 51.75 cu ft
b. 262.3 cu ft
c. 345.0 cu ft
d. 4,140 cu ft

44. A storage area has 75.1 square feet. If supplies can be stored 20 feet high, the cubic feet of storage space is

a. 1,502 cu ft.
b. 1,345 cu ft.
c. 1,227 cu ft.
d. 1,185 cu ft.

45. A storage area is 52" wide x 208" deep. The floor load rating is 600 pounds per square foot. How many pounds may be placed in this area?

a. 10,816 lb
b. 45,060 lb
c. 69,320 lb
d. 75,038 lb

46. A CO_2 extinguisher is most effective against class _____ fires.

a. A
b. A and B
c. B and C
d. A, B, and C

47. Which extinguisher should you use on an electrical fire?

a. CO_2 or dry chemical
b. Water or soda acid
c. Foam or water
d. CO_2 or water

48. Which type of fire extinguisher should you use on a burning stack of lumber?

a. Water
b. Foam
c. CO_2
d. Dry chemical

49. Which type of extinguisher should NOT be used on an oil fire?

a. CO_2
b. Foam
c. Water
d. Dry chemical

Total Points: 49

* * *

Chapter 2

STOCK LOCATION AND MATERIALS HANDLING PROCEDURES

Section I. STOCK LOCATION

2-1. INTRODUCTION

The rapid selection of stock for shipment, the efficient handling of receipts, and the maximum use of storage space are all dependent upon an effective system of stock location. In order to store supplies by popularity in bin sections, and by Federal groups in bulk storage, a workable and well-kept locator system must be maintained. The locator system should contain only that information necessary to help you find the supplies. Lot numbers of perishable materials must be located by age to assure that the oldest stock is issued first. A good locator file consists of a card for each item in stock, with all cards in National Stock Number (NSN) sequence. The locator card should contain the unit of issue (U/I), shelf life code, stock number (NSN), primary location, and secondary location of each item. If more than two locations are required for an item, a locator card should be prepared for each additional location. Only one bin location is maintained for a stock-numbered item stored in bins (this should be the primary location number). As storage areas (warehouses, sheds, or open lots) are laid out and marked in rows, stacks, and levels, a floor plan or planograph is prepared and placed in a conspicuous place. When stock picking (pulling stock for issue), you match the location of an item, as indicated on the locator card, with the floor plan to determine where the item is stored. Receipt documents are routed to the locator file, where current locations are posted to the cards and documents. Thus the locator file is kept current and furnishes the information needed to locate items for storage and issue. When stock in a bulk location has been exhausted, that location is deleted from the locator card; the card is destroyed when all locations on a card have been exhausted of stock. Periodic wall-to-wall location verifications are necessary to check recorded locations against actual locations. Stock locations are also verified during scheduled inventories.

2-2. STOCK LOCATOR SYSTEM

a. Responsibilities. All Marine Corps activities maintaining storage and warehouse facilities will use the Stock Location System as outlined below. Each activity will determine the area and station assignment necessary for its particular operation and issue supplementary instructions regarding the same.

b. Physical location codes. The physical location code is a part of the item locator file and is used to physically identify each individual storage location. The stock location numbering system consists of nine characters, alpha and numeric combinations. Figures 2-1 through 2-7 illustrate this stock location system.

(1) Area. The first character is alpha and may represent a group of buildings within a complex, an open storage area, a single building or warehouse, a shed, or a part of a structure such as a floor. Figure 2-1 shows area examples.

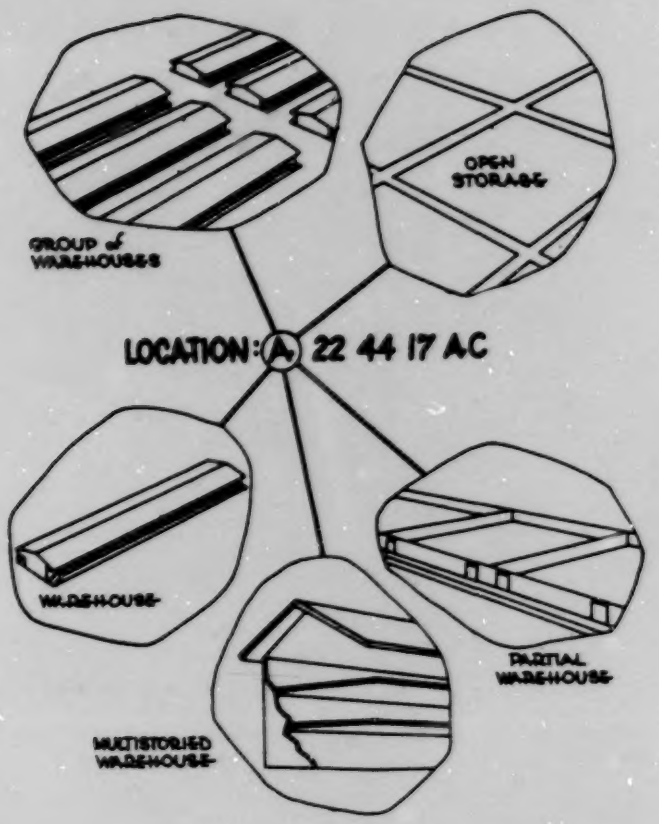

Fig 2-1. Area examples.

(2) Station. The second and third characters are numeric and are used to identify a station within an area. These digits may be used to identify stock-picking stations, stations for receipt of material for stowing, packing stations, floors of a building, sections of a warehouse, or a building within an area. Collection or assembly stations or dropoff stations in a mechanized warehouse system may also be identified. Figure 2-2 shows station examples.

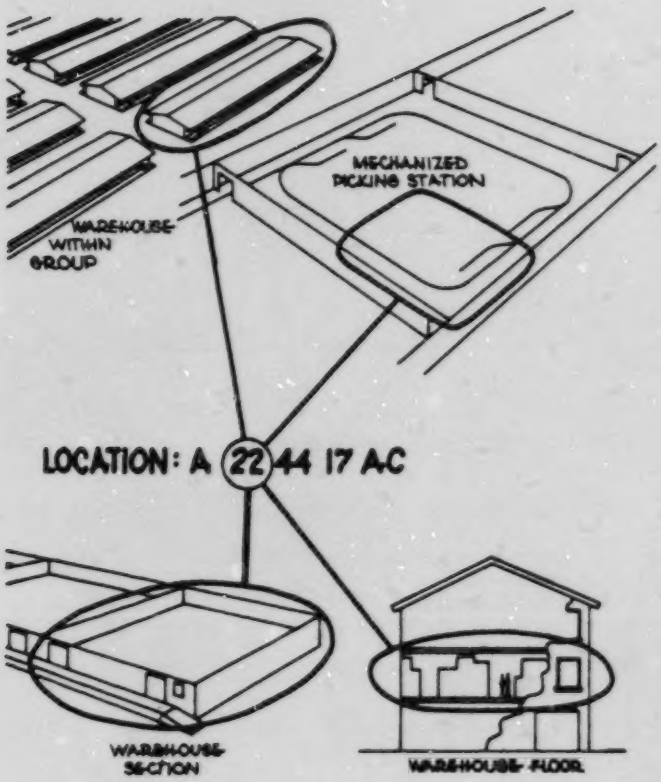

Fig 2-2. Station examples.

(3) Aisle or row. The fourth and fifth characters are numeric and are used to identify aisles or rows within a station. An individual numbering system is used within each station. Figure 2-3 and 2-4 show aisle examples.

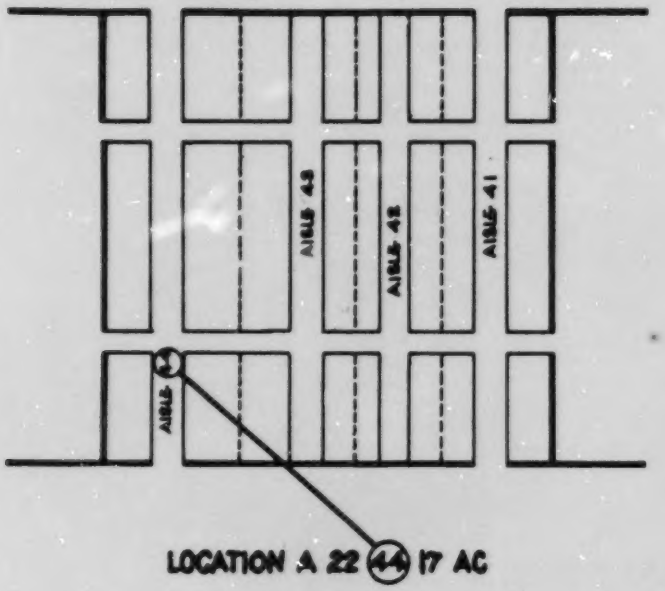

Fig 2-3. Aisles bulk storage.

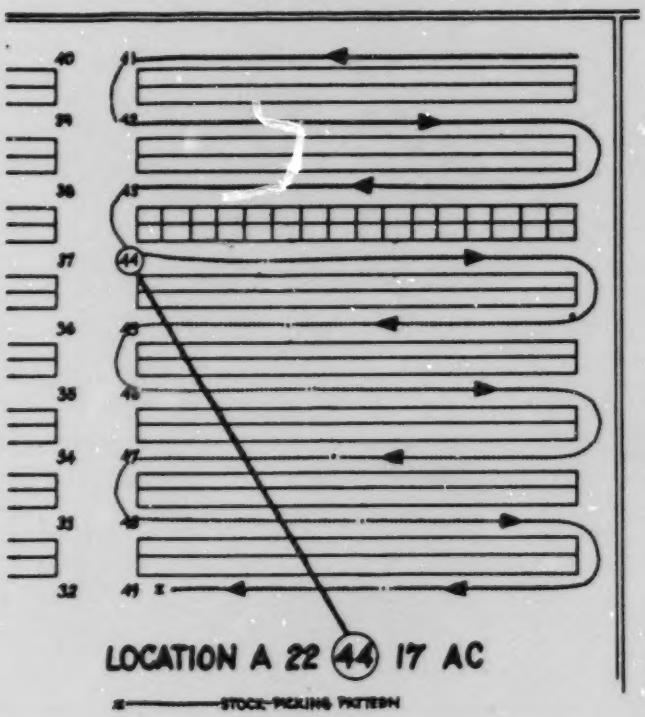

Fig 2-4. Aisles bin storage.

(4) Segment. The sixth and seventh characters are numeric and are used to identify segments of an aisle or row. A segment may be a short lot, stack, rack, or bin or a vertical apportionment thereof, within an aisle with the odd numbers on the left and the even numbers on the right (based on the direction of flow as related to transportation or main aisles/roadways). Within a row, segments are serially numbered without regard to segment numbering of adjacent rows. Under this method, picking documents are computer-sequenced by segments within an aisle or row, enabling picking on both sides of an aisle during a single traverse, or sequential picking within a row. Figures 2-5 and 2-6 show segment examples.

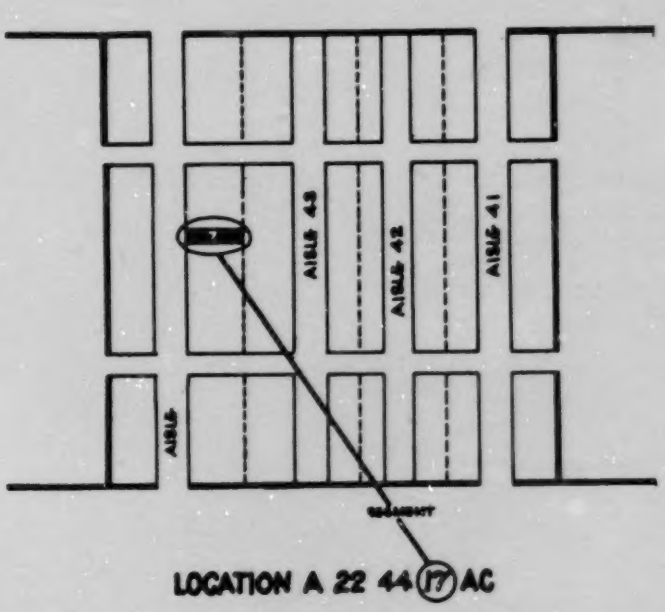

Fig 2-5. Segments in bulk storage.

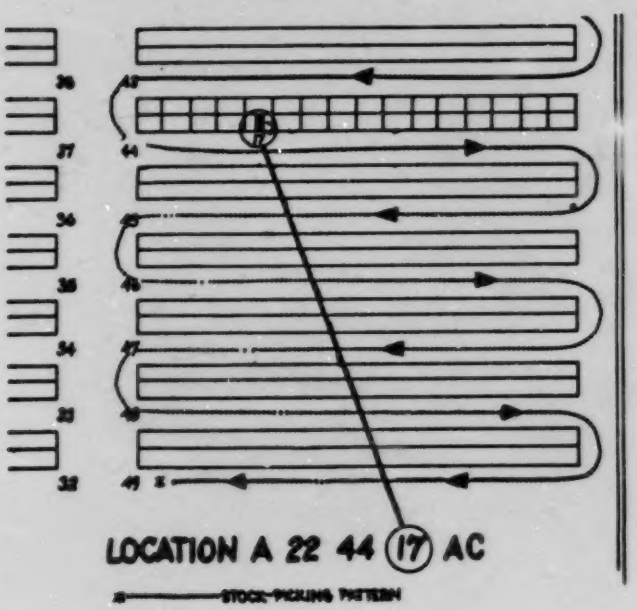

Fig 2-6. Segments bin storage.

(5) Level. The eighth character is alpha and represents the level within segments. Where not applicable, such as in bulk storage, the letter "A" will be assigned. Figures 2-7 and 2-8 show level examples.

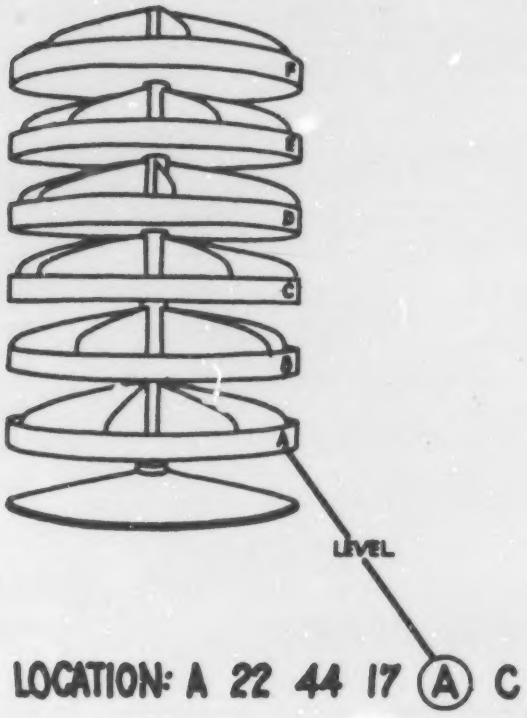

Fig 2-7. Level bin storage.

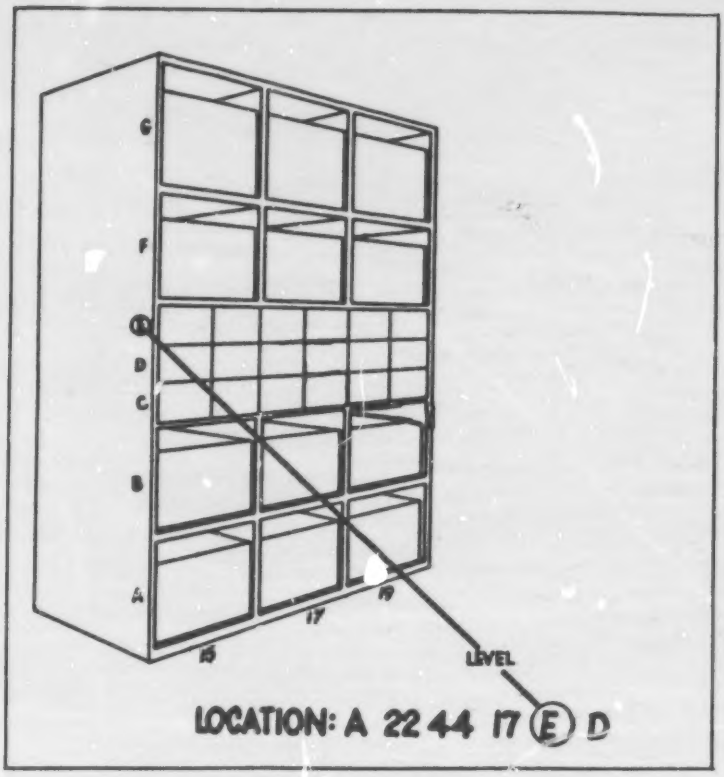

Fig 2-8. Level divided bin storage.

(6) Compartment. The ninth character is alpha and identifies a subdivision of the level within the segment, such as a drawer or compartment of a roto bin. Where not applicable, such as in bulk storage, the letter "A" will be assigned. Figures 2-9 and 2-10 show compartment examples.

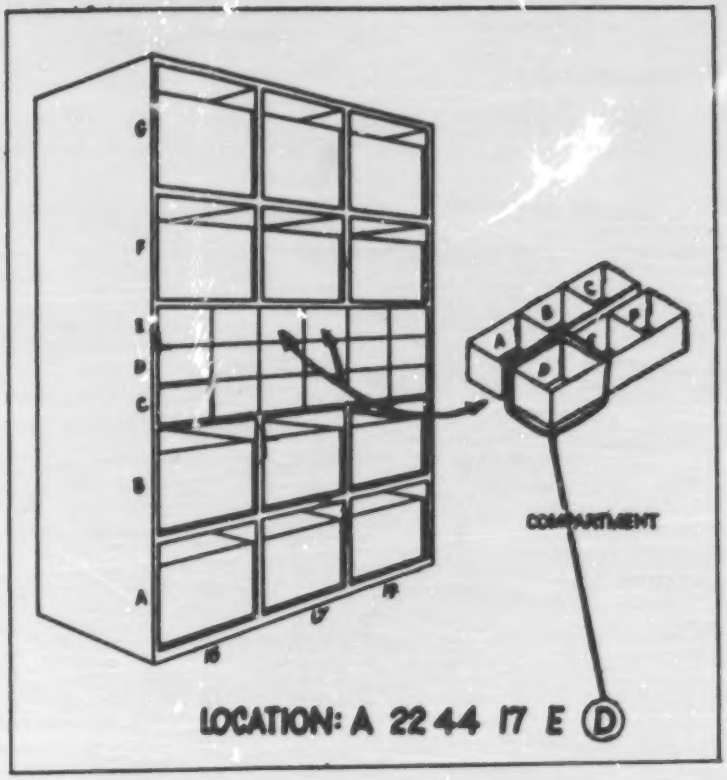

Fig 2-9. Compartment divided bin storage.

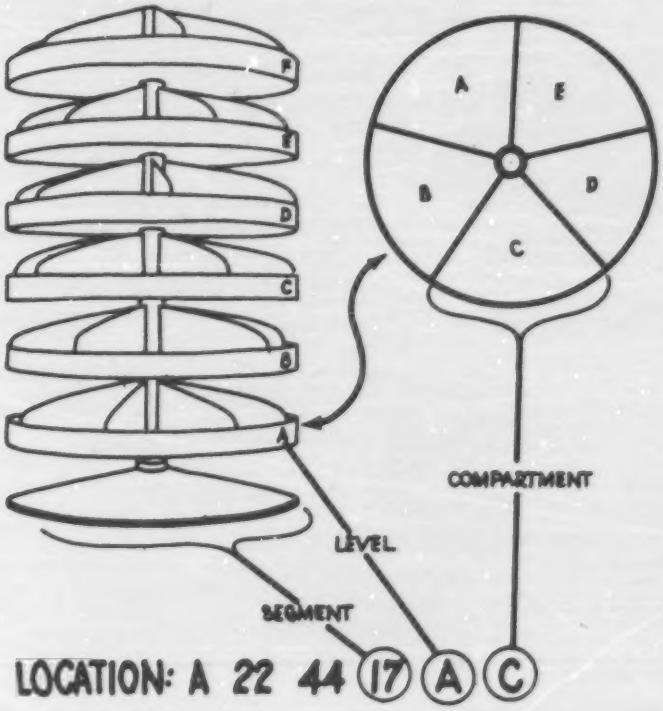

Fig 2-10. Compartment roto bin storage.

c. Assignment of locations. The criteria for the sequential assignment of an aisle or row and segment designators is critical since it determines the amount of physical movement required in receipt stowing and stock-picking operations. The assignment of locations must provide for orderly work performance without returning to an area previously traversed.

1. Marking of storage complex. Each storage activity is responsible for marking the storage complex, and that markings are consistent throughout. As a general rule, they are marked as follows:

(1) Enclosed/improved storage areas. Markings are made with a suitable traffic paint on floors or paving, and with enamel on signs or placards.

(a) Area. Each building and storage lot is marked with a six inch letter adjacent to their traffic entrance, indicating their assigned area.

(b) Station. At the intersection of stations, floor markings or signs are posted which indicate the area and station. Within stations of sufficient size to require further markings, the area and stations are indicated at the intersection of transportation/traffic aisles and rows.

(c) Aisle/row. Aisle/row numbers are painted on the floor or on signs in such a manner that they will be readily visible to a person entering the row from either direction.

(d) Segment. Segment numbers should be painted in such a manner that they are readily visible when standing in front of the segment, and are placed so that the number is centered on the segment to which it applies.

(e) Level. Bins and racks should have the level painted in the center of the shelf or crossmember and indicate that the supplies placed thereon are at that level; i.e., the level must never be interpreted to apply to supplies stored below the level markings.

(f) Compartment. Compartments are marked from the left to right within the level when facing the segment. Figures 2-5 and 2-6 indicate the method for marking compartments.

(2) Unimproved storage areas. Unimproved storage areas are marked in the same basic manner; however, stakes and placards are used rather than floor markings.

2-3. STOCK LOCATION RECORDS

The locator file is an essential part of the stock locator system. It consists of carefully documented record tapes kept in a file. The stock locator file can be compared to a looseleaf address book in that locations can be readily added or deleted. The locator records are maintained by the storage section or warehouse branch.

a. Manual, mechanized locator file. The manual, mechanized locator file is controlled by the dual use of the NAVMC Form 10849. This card is used as a locator card and bin storage card (fig 2-11). It is prepared either as result of a key-punch notice or is a by product of other transactions. This type of file (sometimes called a tub) is constructed in the form of a table with raised side about five inches (fig 2-12). The locator file is maintained in stock number sequence. The location number for this card, as used by the service unit has the following format:

(1) Mount-out or operating stocks (1 digit)

(2) Warehouse or supply dump number (2 digits)

(3) Type storage (1 digit)

(4) Bin unit, box pallet, or crate number (3 digits)

(5) Wooden box number (1 digit)

(6) Fiberboard insert number (1 digit)

This format allows the service unit to use the locator number in a garrison situation and in combat. The overall format contains the information that is used by the different elements of the storage installation (fig 2-11).

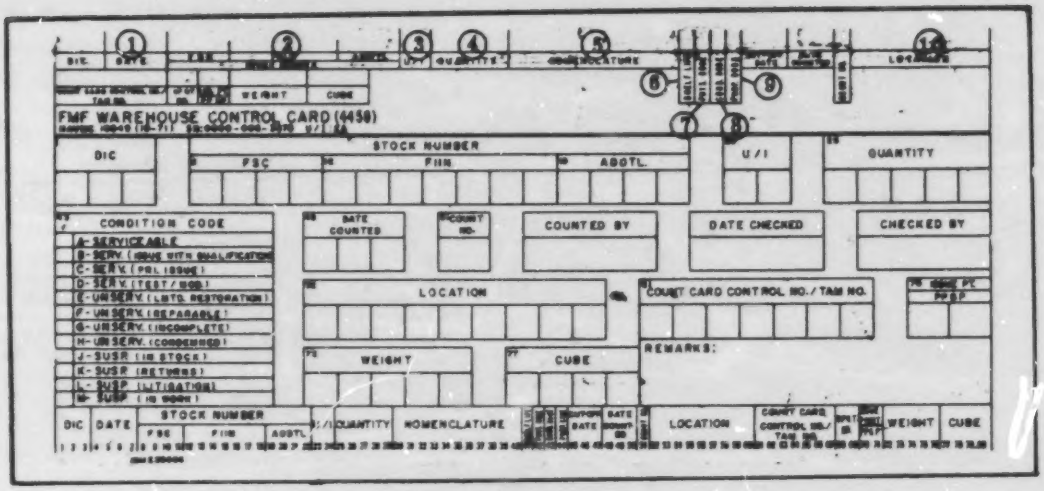

Fig 2-11. FMF Warehouse Control Card, NAVMC 10849.

LEGEND

1. Date card prepared.
2. Stock number.
3. Unit of issue.
4. Quantity (used only with mount-out locations).
5. Nomenclature (optional).
6. Shelf-life code.
7. Physical security code.
8. Condition code.
9. Purpose code.
10. Location.

Fig 2-12. Locator file tub.

As you can see, the location card used in this type of locator system provides all information necessary for the storage and control of material. In addition, these cards can be used for the preparation of shelf-life labels, inventory count cards, and reports as required. This type of locator system is capable of being used in either the field (combat) or in a garrison operation. With the development of data processing machines that are capable of being used in any place that you the Marine will be required to operate, the FMF has the ability of being mechanized at all times. As a Marine and a warehouseman, it is necessary that you are adaptable to any and all situations.

b. Mechanized item locator file. The item locator file of this system is completely automatic. Information is fed into the file from either cards or from another tape. All information necessary for the storage, issue, and control of the material is contained in this file. All branches of the storage facility have inquiry capability from the file by use of remote 1050 computers. The inventory branch uses the file for location verification and investigations. The file is used to produce the inventory count cards, DD Form 1485. A warehouse refusal is routed through the inventory section which will inquire from the item locator file all locations of the item. The inventory section will then, within a 4-hour time frame, conduct a search for the item. This system is more complicated and demanding than the other systems discussed and will not be taught in this course.

2-4. MAINTAINING ACCURATE LOCATOR FILES

a. Recording new locations. When material is moved to a new location, the stockman will enter the location on the material receipt document. He will also enter the stock number, unit of issue, purpose code, location code, and the location on a DD Form 1348. The stockman will place one copy of the receipt document with the material on location and turn in the other copies of the receipt document to the locator. The locator will forward the receipt document to the receipt control section, file a copy of the location notice in the locator file, and forward one copy of the location notice to keypunch for the preparation of the locator and bin storage cards (NAVMC 10639). After these cards are prepared, the location notice is destroyed and the new cards are returned to the locator. The locator will then match the new cards with the temporary location notice in the locator file; if the cards match, the locator will file one in the locator file and forward the bin storage card to the stockman. When the stockman receives the bin storage card, he/she will check it for correctness and place it with the material.

b. Recording changed locations. When all stock of an item is moved from an old location to a new location, manually prepare a temporary locator card; indicate the new location and destroy the old locator card. Prepare and forward a key punch notice to the stock control section; indicate the new location(s) and request the preparation of new locator cards. When you receive the machine-produced locator cards, match them with the manually prepared cards. Then replace the manually prepared cards in the file with the machine-produced cards. When additional locations are assigned for items already on location, prepare a temporary locator card and request machine-produced cards for the additional locations. A file may be maintained for all locator cards expected from the machine room. This file should contain a duplicate copy of all key punch notices requesting new cards, as well as a listing of NSN's and locations of new items being stored in the warehouse. When you receive the locator cards, you may destroy the key punch notice after checking that all cards were received. This file, if used, should be reviewed each week to ensure timely receipt of new cards.

c. Deleting locations. Whenever an item is completely expended from a bulk storage location, destroy the applicable stock locator card and notify the stock control section of the deleted location. Only one location is maintained in the bin section for an item. A bin location should be deleted only when it is determined that the item will no longer be stocked. If an item is completely exhausted from a bin location, the item should be replenished from bulk stock.

d. Change card action. All NSN's and units of issue used by the Marine Corps are published in the Marine Corps Stock List. When the NSN or unit of issue of an item is changed, a change card is used to automatically change this information in the locator cards (by machine). On the date the changes are to be made, the locator files are taken to the machine room and the changes are processed. When the locator file is returned, you will receive a deck of new locator cards and a deck of cross-reference locator cards. The new cards should be checked and filed. The cross-reference deck will show all changes to the locator file. Items which have had stock number and/or unit of issue changes must be pulled from location, remarked with the new information, and replaced on location. If the stock number change requires that the item be moved to a new location, action must be taken to change the locator card. The locator file clerk will review the cross-reference locator deck and initiate the necessary action to re-mark the items in stock. When the stock number or unit of issue on a locator card is being checked for a possible error, the latest information should be used. The results of change card action will be published in changes to the Marine Corps Stock List. The cross-reference change deck to the locator file should be retained for a period of 30-days.

e. Wall-to-wall location verification. Periodic wall-to-wall location verifications will be required. This verification of locations is a normal part of the warehouse operation. The operation of the warehouse and an accurate inventory depend upon accurate stock location data. A wall-to-wall location verification ensures that all material within a storage area is properly located, that all locations are correctly recorded in the locator files, and that the balance cards are present for each item in stock.

(1) In activities which have a small number of items, you can prepare a manual list of the unit of issue, stock number, and location of each item in stock. Then check this information against the locator file. When errors are found, the locator file clerk should take immediate corrective action. When the locator file agrees with the material in stock, the locator cards should then be checked against the balance cards in the stock control section to ensure that there are balance cards for each item in stock.

(2) In accounts which have a large number of items, you may duplicate the locator file, then check the duplicate cards against the material on location. Check the unit of issue, stock number, and location number. Each item on location must have a locator card. When errors are found, corrective action should be taken immediately by the locator file clerk. When the locator cards agree with the material in stock, they should then be checked against the balance cards. If a balance card has a balance but no locator card, or if a locator card has no corresponding balance card, this is an error. These errors should be corrected by spot inventories, and adjustments should be made to the records as required.

f. Inventories. Verification of locations of all items of materials is a regular procedure during scheduled inventories of stock. The locator file is duplicated and each inventory count card is placed on the material. During the counting of each item, the inventory team must check the unit of issue, stock number, and location. If an item is on location without an inventory count card, a card is prepared manually and the material is counted. A locator card is made for the location file from the information on the manual inventory count card. To minimize the preparation of manual inventory count cards, a verification of locations should be performed as close to the actual date of inventory as possible. If the material on an inventory count card cannot be found on location, the locator file must be corrected. The inventory count cards are then checked against the balance cards (by machine). All errors in the balance cards are adjusted or corrected as required.

Section II. MATERIALS HANDLING PROCEDURES

2-5. INTRODUCTION

Materials handling is the movement of material from one place to another without affecting its value. The greatest economy in moving material is achieved by not handling the material at all. Since this situation rarely exists, an attempt must be made to keep handling to a minimum. The number of pieces to be moved determines the method of handling. One package weighing 5- to 50-pounds may be handled very easily by one individual; however, if a number of these packages are to be moved, individual handling becomes impracticable. Greater economy is achieved by placing a number of packages on a pallet to form a unit load, thus more material can be moved at a single time. The more pieces or pounds moved as a unit load in a single handling operation, the lower the cost per piece or per pound and the shorter the time required to move any given volume.

2-6. BASIC PRINCIPLES OF MATERIALS HANDLING

Materials handling practices vary but not the basic principles remain constant. Often these principles are forgotten or they are not applied. The following principles are presented to help you better understand the handling of material.

a. Least handling is the best handling. In a warehouse, all material received or issued must be handled. The doors, aisles, and storage space in warehouses are designed to allow materials to be moved in and out with a minimum of handling. You should take advantage of this preplanning to move material in and out of your warehouse efficiently.

b. Materials handling equipment has multiple applications. The materials handling equipment in your warehouse is purchased by the Marine Corps because of its capability to handle more than one task. You should know what tasks can be performed with each piece of equipment.

c. Equipment should never be overloaded. Overloading causes excessive equipment wear and creates a situation where there is a greater potential for accidents.

d. Volume dictates the method of handling material. Since the number of pieces to be moved determines the method of handling, this should be your first consideration. Then, equipment should be selected to do the job with the least amount of handling.

e. Straight-line flow. The shortest distance between two points is a straight line. The movement of material between any two points should travel by way of the shortest distance. The warehouse, including aisles, doors, and direction of storage, is laid out on this principle. Since large lots are located on cross aisles, a forklift truck needs to make only one turn to store or withdraw the largest volume of stock. A truck or rail car is positioned at the door nearest the location where the supplies are to be moved from or to. All storage and materials handling should be planned on this principle.

f. Continuous flow. Materials should be removed continuously along any production line. They should always move as smoothly as possible; interrupted flow causes confusion and delay. In receiving and issuing, materials should be moved directly to the carrier or stack. Plan where you want the material to go, then take it there!

g. Concentration of operation. In the movement and handling of materials, the operation should be limited in distance and area covered. Operations spread over too large an area cause problems in handling and supervision.

h. Principles of manual handling. When manual handling is necessary, materials should be moved on a horizontal plane or with the aid of gravity. If personnel have to reach either down or up, extra effort is needed. This effort is greatly reduced by planning the workspace layout. The ideal lifting position is at the waist. The nearer the waist a container or part can be picked up and disposed of, the greater the efficiency. Except for handling objects of 50-pounds or less (for short distances), appropriate equipment should be used to move items.

2-7. MATERIALS HANDLING EQUIPMENT

When materials handling equipment is selected, the size, weight, and container strength of the items to be handled should be considered. Containers such as large bales, crates, and boxes handled as a unit may be efficiently handled and stacked by forklift trucks. Smaller containers should be placed on pallets and handled as unit loads.

a. Powered equipment. Powered materials handling equipment is propelled by battery-powered electric motors or internal combustion engines. Wheeled materials handling equipment has either solid rubber tires or pneumatic tires. General indoor operations are performed by vehicles propelled by electric motors or gasoline engines with solid rubber tires. Outdoor operations are performed by gasoline or diesel-engine driven vehicles with pneumatic tires.

(1) Forklift trucks. A forklift truck is a vehicle designed to pick up, carry, and stack unit loads of supplies and equipment. The typical forklift truck (fig 2-13) has a front-wheel drive; the rear wheels are used in steering. The load is carried at the front of the truck on a 2-tined fork-and-lift carriage assembly which is raised and lowered by a hydraulic mechanism. The forks and vertical supporting frame can be tilted forward or backward to pick up loads and to balance the load in transit. Forklift truck capacities vary according to the weight of the load that can be carried and the height to which the load can be lifted. The maximum lifting height ranges from 100- to 210-inches. Forklift trucks used for indoor warehouse duty have a safe lifting capacity of 2,000- to 6,000-pounds; those for outdoor duty have a safe lifting capacity of 4,000- to 15,000-pounds. When unit loads are hauled a distance greater than 400-feet one way, efficient use of the forklift truck is reduced. The primary advantage of the forklift truck is its flexibility. Its most efficient use is for stacking. The forklift truck permits maximum use of cubic space and permits rapid relocation of supplies.

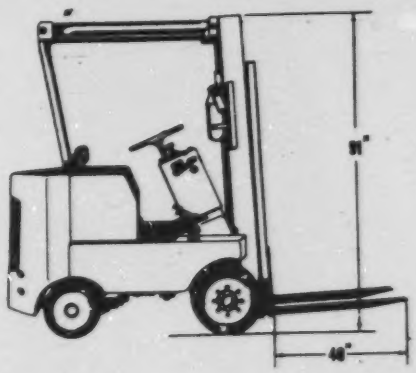

Fig 2-13. Forklift truck most widely used in the Marine Corps.

(a) Gasoline-powered. Since most items in the Marine Corps are moved in unit loads, the gasoline-powered forklift truck is the workhorse of the storage section. The gasoline-powered forklift truck is used to unload, move to storage and stack, and move from storage and load all but certain commodities which require the use of an electric-powered forklift. Because it is versatile, the gasoline-powered forklift truck most widely used in the Marine Corps is the 4,000-pound, 144-inch lift type (fig 2-13). It is capable of entering rail cars for loading and unloading, as well as stacking supplies to a height of 20-feet. Using the 12-foot lift, you can stack unit loads to 20-feet if the unit loads are approximately 4-feet high and not over 2,000-pounds in weight. The first three pallets are stacked in the usual manner, making a stack approximately 12-feet (144") high. Two pallets are then picked up at one time and placed on top of the three pallets already positioned, making a 20-foot stack.

(b) Diesel-powered. For rough terrain the Marine Corps uses a diesel-powered forklift (model RKF-060)(fig 2-14). It is equipped with high flotation tires for use on unprepared or unstabilized surfaces, over beaches, in deep sand, or in snow, ice, or mud. This forklift can be operated in either two- or four-wheel drive with two- or four-wheel steering. The forks can also be moved hydraulically from side to side. Another feature is the ability of the forklift to tilt up to 10 degrees from side to side by use of the hydraulic system. It has a lifting capacity of 6,000-pounds and a lift height of 12-feet.

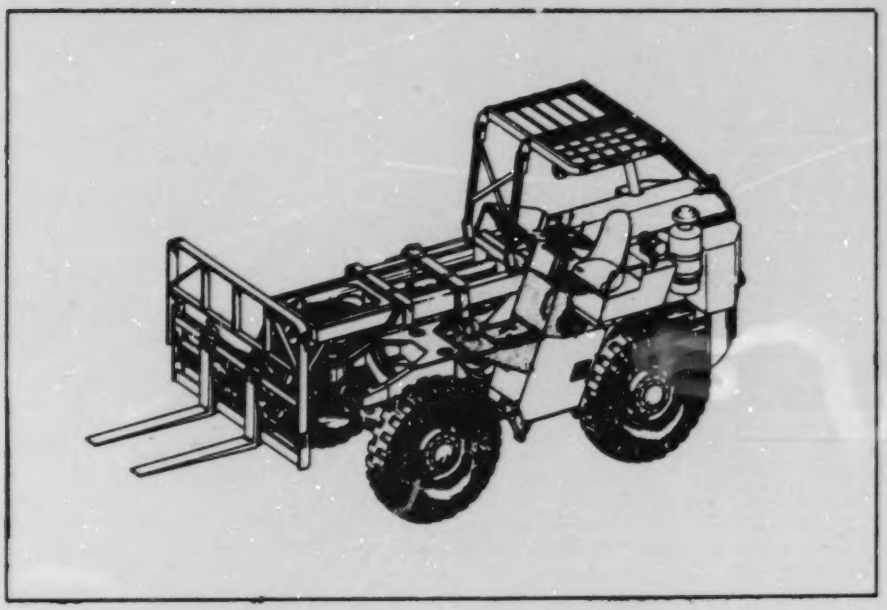

Fig 2-14. Model RKF-060 rough terrain forklift.

(c) Electric-powered. Electric-powered forklift trucks are equipped with solid rubber or semisolid (or cushion) tires for indoor operation. This forklift must be used on smooth surfaces. It is used in closely confined or poorly ventilated spaces to avoid the hazard of accumulated carbon monoxide. Certain items, particularly fresh fruits and vegetables, will absorb the fumes from gasoline engines. Electric power is required to handle these items. Electric-powered forklift trucks are widely used for handling explosives and flammable materials such as paint, oil, gasoline, and gas.

(2) Warehouse tractors. A warehouse tractor (fig 2-15) is a self-propelled vehicle with rear-wheel drive. It may be used for direct drag-towing of material on skids or for pulling one or more trailers. Tractor-trailer trains are used to move a large amount of material 400-feet or more. The trailers are loaded and

unloaded by forklift trucks. Tractor capability is ordinarily expressed in terms of drawbar pull, which is a measure of the force that the tractor can exert in pushing or pulling loads. The actual capacity of a tractor, which is far in excess of its drawbar rating, depends upon the type of surface and percent of grade on which the tractor is operating. Gasoline-powered models vary in capacity from 2,000- to 7,500-pound drawbar pull; the electric-powered models vary from 2,000- to 4,000-pound drawbar pull. The major advantage of a warehouse tractor is that one man and one tractor can haul a long line of trailers on which thousands of pounds of supplies can be loaded. The tractor acts as a locomotive for a trackless train of trailers.

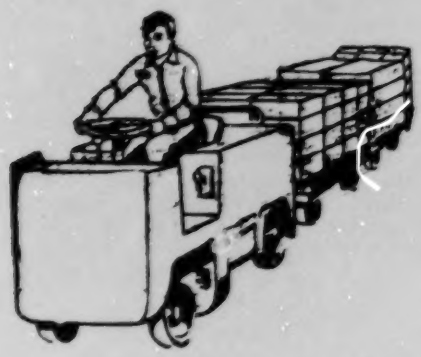

Fig 2-15. Warehouse tractor.

b. Nonpowered equipment. Nonpowered materials handling equipment depends on powered equipment, manual power, or gravity power for operation. Some nonpowered materials handling equipment used in the Marine Corps and their principle characteristics are:

(1) Gravity conveyors. There are two types of gravity conveyors: the roller conveyor (fig 2-16) and the wheel conveyor (fig 2-17).

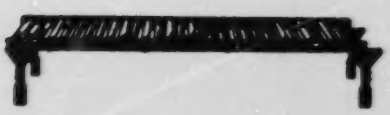

Fig 2-16. Conveyor, gravity, roller.

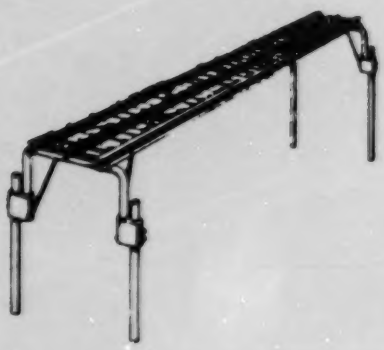

Fig 2-17. Conveyor, gravity, wheel.

(a) The gravity roller conveyor is a continuous platform of evenly-spaced rollers that turn freely in the frame of the platform. It is a simple device on which packages can be rolled downhill. (Many supermarkets use this type.) A fall of 3-inches in each 10-foot section is usually sufficient to keep an item moving. Some conveyors have raised sides to guide boxes of fragile or explosive materials. The legs of the conveyor section can be adjusted to change the level of the conveyor. A gravity roller is most effective when used to move a large number of packages over a definite line of travel.

(b) A gravity wheel conveyor is an inclined platform with a carrying surface consisting of small, uniformally spaced wheels turning on fixed bearings. The force of gravity moves the packages downhill over the rolling wheels. Because the wheels turn more easily than the rollers on the conveyor, the incline of the wheel conveyor need not be as great as that required for the roller conveyor. Fixed and portable models differ somewhat in the length of sections and type of support. Fixed models may be of heavier construction and have supports designed to be fastened to the floor. The sections of the fixed type of conveyor are usually longer because they are seldom moved. Portable models move on casters or wheels and have sections from 5- to 10-feet in length. The gravity wheel conveyor is used to best advantage where a large number of single packages are being handled in a fairly continuous stream. In such operations as packaging, assembly, or marking, the wheel conveyor can be operated without an incline and the packages can be pushed by hand to the next worker. The wheel conveyor can be used to move light, bulky packages over gradual declines that are not steep enough for use of the roller conveyor.

(2) Warehouse trailers. The warehouse trailer is a 4-wheel vehicle designed for use with a warehouse tractor (see fig 2-15). It consists of a platform which is constructed of wood and steel, and mounted on wheels. The wheels may be all steel or they may be steel equipped with solid rubber or pneumatic tires. The warehouse trailer has an automatic or self-locking coupler so that it may be quickly attached to other trailers to make tractor-trailer trains. The warehouse trailer may be used most efficiently in tractor-trailer trains and operates best on hard surfaces. It may on occasions be used as a 4-wheel handtruck. The primary purpose of the trailer, however, is to serve as a portable, load-carrying platform for large quantities of supplies hauled over distances by a warehouse tractor. By using attachments, you can adapt the trailer to special tasks.

(3) Handtrucks. There are two types of handtrucks. Probably the best known and most widely used type is the 2-wheel general utility handtruck (fig 2-19) which consists of a frame, supported at one end by two wheels and at the other end by a handle held by the operator. A steel nose iron is attached to the lower end of the frame to aid in picking up and supporting the load. The handtruck is designed to be handled by one man. The wheels may be made of steel, or they may be equipped with solid rubber or pneumatic tires. The other type of handtruck is the 4-wheel platform truck. It consists of a wooden platform mounted on a rigid axle with two wheels at one end and two caster-type wheels at the other. The wheels are made of steel; tires, if used, may be either pneumatic or solid rubber. The platform is low enough to permit manual loading. A bar handle at one end of the platform enables the operator to push the truck (fig 2-20). Load capacities vary with the weight of the truck and size of the platform. Handtrucks are most efficient when used to transport small quantities of materials over short distances.

Fig 2-19. General utility handtruck.

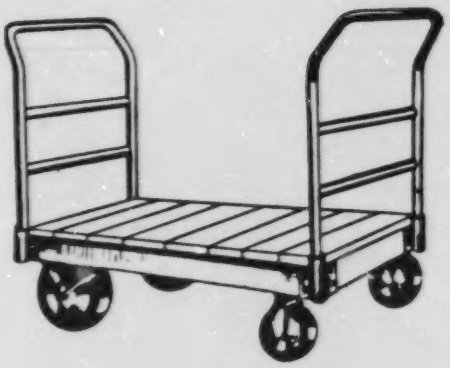

Fig 2-20. Hand platform truck.

(4) Pallets. A pallet is a wooden or metal platform on which supplies are loaded, transported, and stored. In addition to allowing uniform stacking, the use of pallets increases storage capacity, speeds up inventories, and reduces time in loading operations. Containers are placed on pallets in patterns that provide for maximum load stability. They are seldom stacked on pallets to a height of more than 4-feet (including the pallet). Items stored on pallets are easier to inspect and easier to withdraw for shipment. Pallets may be classified as containers when they are used to consolidate or unitize loose items or several containers for shipment and storage. The standard pallet in the Marine Corps is the 40- x 48-inch pallet. This pallet is designed for 4-way entry (entry from four directions) with the forklift truck; it is used wherever full 4-way entry is required by materials handling equipment. This pallet may be loaded wherever materials enter the supply system for storage, and may be shipped loaded from storage. It may be used in both covered and uncovered storage areas.

2-8. SAFETY FACTORS IN MATERIALS HANDLING EQUIPMENT

a. Mechanical alterations. Materials handling equipment is built and guaranteed by the manufacturer to perform specified functions. Mechanical alterations to powerplants, hydraulic systems, operating levers and controls, lifting and structural members, etc., may seriously affect operation of equipment or may endanger personnel. Alterations to materials handling equipment must not be made without the approval of the Commandant of the Marine Corps.

b. Safety equipment. Safety is an important consideration in the design of materials handling equipment. Safety features are provided to protect operators as well as the material that is being moved. Gasoline-powered materials handling equipment, for example, must have gas fill caps and metal sediment bowls that have special safety features. Forklift trucks of all types must be equipped with overhead safety guards fabricated out of steel. These overhead guards must be capable of absorbing, without damage to the guard, the impact of a wooden box of one cubic foot volume weighing 100-pounds dropped from a distance of 5-feet not less than seven times. The guards are designed so that they do not interfere with the operation of the truck nor impede the operator in mounting or dismounting. These are just a few examples of safety devices provided on materials handling equipment. A few tips which apply to the safe operation of the forklift truck are illustrated in figures 2-21 and 2-22.

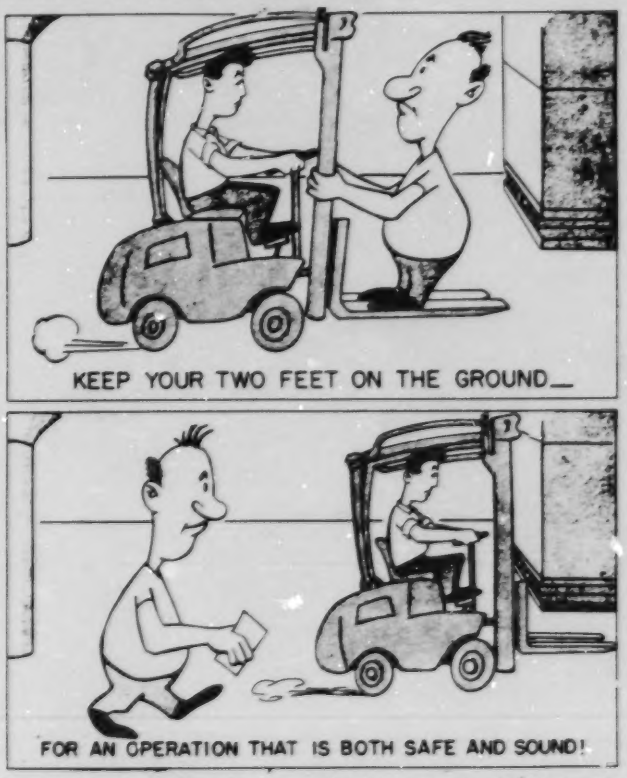

Fig 2-21. Only the operator should ride forklift trucks.

Never permit unauthorized persons to operate fork trucks.
Sound horns or warning gongs at all blind intersections.
Don't overload your truck ... lighten loads instead of counterweighting.
Don't descend ramps with load in front ... drive down backwards at slow speed.
Drive s-l-o-w-l-y over railroad tracks and rough surfaces.
Watch overhead clearance at doorway and cross beams...
Make sure brakes are holding before leaving your fork truck.
Check floor strengths carefully.... don't risk fork trucks on weak floors.
Don't cut corners . . . watch your turns and prevent accidents.
Check bridge plates frequently . . . be sure they're secure.
Don't "jam" your brakes . . . skid marks are signs of bad driving.
Don't attempt "minor" repairs . . . call a qualified repairman.

Fig 2-22. Forklift truck safety tips.

2-9. RECEIVING OPERATIONS

In storage operations, a knowledge of receiving supplies is extremely important. The receiving of supplies is one of the major operations in the performance of an active storage mission. Prompt and accurate processing of receipts is necessary for effective warehousing. The basic principles of receiving are applicable wherever supplies are received for storage, issue, shipment, or distribution. An efficient receiving operation is a step-by-step process consisting of planning the operation, spotting the carrier, unloading the carrier, and moving the supplies to storage.

a. Planning the receiving operation. The initial planning for the receipt of supplies begins when you receive advance notice that a shipment is on the way. The advance planning involves determining where supplies will be stored and what labor and materials handling equipment will be required to handle the operation. The planograph is used to determine storage locations for incoming supplies. In large active storage operations, the freight traffic office maintains centralized control of internal truck and rail activities for both receiving and shipping operations. Through centralized control, complete records of truck and rail movements within the storage facility are available for daily planning purposes. These records present a historical account of truck and rail car receipts and shipments. They provide a means of pinpointing undue delays in loading and unloading shipments, thus helping you to avoid demurrage charges. These records also provide information on the size of trucks and rail cars received or ordered, where they were spotted, when they were spotted, and when they were released.

(1) Due-in information. You may receive several types of due-in information: information that a contract has been awarded, with shipment to take place at a specified time; notice that a shipment is enroute; or actual notice by the freight traffic office that a shipment has arrived. The advance notice may be in the form of an advance copy of the shipping document or Material Inspection and Receiving Report, a teletype message, or a message by telephone or messenger. On the other hand, you may receive shipments without any due-in information. These shipments are not located until verified as valid due-ins.

(2) Selecting a location. The planograph is used to determine storage locations for incoming supplies. You should check the locator file, since there may be room for the incoming item in an established location for that item. If the stock number is not recorded in the locator file, or if there is no room for the quantity being received on the established location, check the planograph for an empty storage space that will hold the incoming supplies.

(a) Small or mixed shipments. Small shipments may be received daily by mail, or a rail car of mixed small shipments may arrive. You can best handle them at a central receiving section. First sort them, then transport them to the storage areas or warehouses for storage. Most of these small shipments will go into bin sections, pallet racks, or small and medium storage along main aisles.

(b) Bulk supplies. To plan for the receipt of bulk supplies, check the locator file for established locations. If the shipment cannot be stored with like items, select a storage location from the planograph. The square feet of the location selected should be as near to the square feet required for the incoming supplies as possible.

(c) Special commodities. The storage of special commodities requires special planning considerations. Some examples of special commodities warehoused in the Marine Corps are: dry cell batteries, ammunition and explosives, photographic materials, oils and greases, paints, rifles and pistols, and hazardous commodities (such as flammable liquids, gases, acids, and radioactive materials). Most of these commodities must be stored in special warehouses or in special security areas in general-purpose warehouses. Some have to be stored and controlled by lot number or serial number, or by date of manufacturer. Every warehouseman should be concerned with the safety of the area in which he/she works. When you see special commodities stored in a dangerous manner, notify the warehouse manager. Complete instructions on the storage of special commodities are published in the Storage and Materials Handling Manual (DOD 4145.19-R-1).

b. Moving the supplies to storage. The ideal situation for moving supplies from the carrier to the storage location is to spot the carrier at the warehouse door nearest the intended storage location, especially when a full carload of the same commodity is received and is to be stored in one area. When the items received are to be stored in several different

locations or warehouses, the proper materials handling equipment must be selected to do the job. As a general rule, pallet loads of supplies are moved by forklift truck if the distance involved is 400-feet or less. Supplies to be moved more than 400-feet should be moved by a tractor-trailer train. If repacking or re-marking is necessary to prepare supplies for storage, this should be done during the unloading operation to reduce additional handling. The receiving operation is complete when all items of the shipment have been replaced in their final storage locations, all locations are recorded on the receiving document, and the completed receiving document is forwarded to the storage office.

(1) Spotting the carrier. Spotting the carrier is the process of locating a rail car or truck in the proper place for loading or unloading. The carrier should be spotted at the door nearest the location the supplies will be stored in or loaded from. There are definite time periods during which a carrier may be held without a penalty charge being imposed. This penalty charge is known as demurrage. When a carrier is spotted, the supplies should be removed in the minimum time required to do the job.

(2) Unloading the supplies. The unloading operation depends largely on the type of carrier, type and weight of containers, and the type of facilities available for unloading the supplies. Occasionally, freight cars of unpalleted supplies are received for storage. If these unpalleted supplies are all destined for one location, they are loaded onto pallets by hand and transported to the storage location by forklift truck or tractor-trailer train. If, however, the shipment is made up of different items, a conveyor may be used so that items can be sorted and tallied before they are loaded onto pallets for transport to the various storage locations.

(a) A representative from the freight traffic office will inspect the seals on the rail car, open the door, and make an inspection to determine the appearance and condition of the load. If there is damage that exceeds $10.00, the unloading operation will be held up for further inspection by the transportation officer and a representative of the carrier. If there is no damage, or the damage is not traced to the carrier, the unloading operation can be resumed. All reports of damage will be accomplished by the transportation office personnel.

(b) As boxes are removed from the carrier, they are tallied on the shipping document. If each box in a shipment is numbered consecutively from number 1, the required numbers may be annotated on the top of the shipping document. As the numbered boxes are removed from the carrier, a line is drawn through matching numbers on the edge of the document. This method provides an easy check to ensure that all box numbers, as indicated on the shipping document, are received. If a shipment is received without an accompanying document, the checker may use any blank paper or form to record the information pertaining to the items or boxes. As the supplies are unloaded, they are taken directly to the predetermined storage location. This location is indicated on the receiving document for later posting to location records.

c. Palletizing supplies. Items which can be palletized should be formed into unit loads, as soon as received, and should be handled as units throughout the entire storage and materials handling operation. (Unit loads are explained in paragraph (3) below.) For example: if nonpalletized items are received, a pallet is placed in the carrier (as near the material as possible) so that manual handling is reduced to a short move from the stack to the pallet.

(1) Standard pallets. In the Marine Corps, the 40- x 48-inch pallet has been adopted as the standard general-purpose pallet. In addition, a special-purpose pallet has been adopted for use in the FMF. This 32- x 40-inch, 4-way entry pallet will be used in the FMF for storage of bin items such as spare parts. Adopted for use with this pallet is a wooden box with inserts for storing small items. Although the FMF will use this 32- x 40-inch pallet and the new box for storage of bin items, it will continue to use 40- x 48-inch pallets for storage of bulk items.

(2) Pallet pattern. Containers or items are arranged on the pallet in a particular pattern for each type of item. The pallet pattern used should cover as much of the pallet area as possible. On 40- x 48-inch pallets, overhang of the containers should not exceed 2-inches on each 48-inch side and 1-1/2-inches on each of the 40-inch sides. The pallet pattern should permit, when possible, the formation of interlocking patterns to help keep the unit load stable. All unit loads of a given item should have units or containers of identical count and should be loaded in the same pallet pattern. The most desirable unit load constructed on the 40-x 48-inch pallet is approximately 53-cubic feet. This unit load is 48-inches in height,

including the pallet. Try different arrangements of individual containers to determine the best pattern.

(3) Unit loads. A unit load (fig 2-23) is composed of one or more items handled as a single unit. The unit load is supported by a pallet or a base so designed that the load can be picked up by mechanized handling equipment. In the movement of material, the combining of numerous items into a unit load is most economical. The handling of material in unit loads uses effectively the materials handling equipment available and eliminates manual handling of individual items. Damage to items while in storage or during handling is less likely to occur. There are no fixed weight limits for palletized unit loads in storage, except that equipment capacities must not be exceeded in moving the unit load. The palletized unit load for a shipment is limited to 2,500-pounds, including the pallet, with one exception--cylinders of compressed gas stacked on end. Loads destined for overseas shipment must not exceed 2,100-pounds. Since the goal to be reached by the use of unit loads is to keep them as unit loads until they reach the user, it would be impracticable to put 3,500-pounds in a unit load for storage, then take off 1,000-pounds to permit shipping by rail. For this reason, stored palletized unit loads usually conform to shipping weight limitations. Note that the weight restrictions are for palletized unit loads and not for such items as large crated equipment, unit loads of lumber, etc. To use the 40- x 48-inch pallet effectively in both boxcars and trucks, restrictions are placed on the unit load overhang allowed. There are two different limitations on pallet overhang, and again the restrictions are based on whether the palletized unit load is for storage or shipment. The restrictions for shipment (1-1/2-inches on each 40-inch side and 2-inches on each 48-inch side for a maximum 43- x 52-inch unit load) should be applied for storage also.

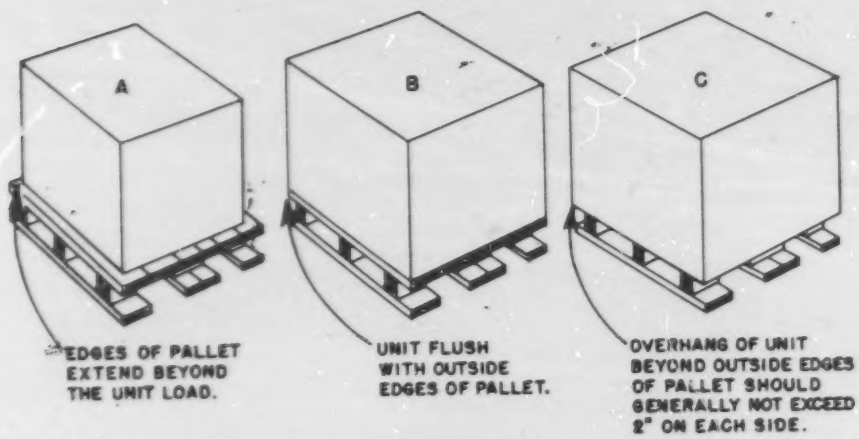
A
B
C
EDGES OF PALLET EXTEND BEYOND THE UNIT LOAD.
UNIT FLUSH WITH OUTSIDE EDGES OF PALLET.
OVERHANG OF UNIT BEYOND OUTSIDE EDGES OF PALLET SHOULD GENERALLY NOT EXCEED 2" ON EACH SIDE.

Fig 2-23. Unit loads.

(4) Strapping unit loads. Steel strapping of sufficient size and strength, in relation to the gross weight of the load, must be used when required. Further information on strapping may be found in Marine Corps Order P4030.21 .

d. Reporting locations. Location numbers are placed on all receiving documents routed to the locator file clerk. These locations must be recorded in the locator file before the documents leave the storage section.

e. Document disposition. All receiving documents must be forwarded to the storage office, then to the stock control section for recording and filing.

2-10. ISSUING AND SHIPPING PROCEDURES

Issuing is an important part of warehousing operations and must be done efficiently so that the using agency receives supplies on time, in the quantity requested, and in good condition. The effectiveness of issuing depends upon proper receiving, storage, and packing. Planning the issuing operation actually begins long before the receipt of a document authorizing the issue. The receipt, location, and storage of all supplies should be planned so that the issuing can be accomplished simply and efficiently. Planning for a specific issue or shipment begins with receipt of the proper document authorizing delivery of designated items to a specified destination.

a. Planning the issuing operation. Issuing is the final link in the chain of warehouse operations. Like receiving, the details vary with the type of supplies to be handled and the method of shipment. As in receiving operations, there is a logical sequence to be followed; that is, planning the operation, ordering the carrier, selecting and moving stock to control the carrier, and loading and releasing the carrier. These steps are basic to any issuing operation; however, they may be modified to some extent. Advanced planning begins upon receipt of the document authorizing delivery of supplies or upon receipt of some formal notice that a shipment is to be made. Careful evaluation and determination of action to be taken is required to ensure an efficient operation. Planning includes but is not limited to the following considerations:

(1) Total quantity to be issued.

(2) Total weight and cube to be shipped.

(3) Special preparation for shipment requirements, such as packing and marking.

(4) Availability and assignment of labor and equipment.

(5) Method of transportation to be used.

(6) Date supplies are required at destination.

b. Processing the shipment document. It is important that all shipments be properly documented to eliminate delay, damage to perishables, or loss. The weight and cube of material to be shipped should be furnished to the freight traffic office by the storage section. Shipments should be assembled and shipped in carload or truckload lots in order to reduce the cost and conserve transportation equipment. When freight planning is completed, the shipping document is routed to the warehouse where the supplies to be shipped are selected and prepared for shipment.

(1) Obtaining location numbers. When a document is received for issue or shipment of material, it must be routed first to the locator file clerk where all location numbers for the item are entered on the document.

(2) Assigning priority of issue. The date the supplies are required at the destination and/or the priority of the document will determine the priority that the issue will receive in the workload of the storage section. The storage officer will assign a release date to issues.

c. Stock selection

(1) Rotation of stock. Stock selection should be made so that the oldest stock is issued first. Some items, like batteries and photographic films, have a short shelf life which must be considered. Some items are controlled by lot numbers, serial numbers, and date of manufacture. These control numbers and dates must be considered when stock is being selected for issue.

(2) Serviceability of supplies. Every requisition or issue document is a request for a serviceable item, unless otherwise stated on the document. No unserviceable item should knowingly be issued to using units.

d. Preparation of supplies for issue

(1) Packing the supplies. Packing may be required, such as consolidation of bin items for a shipment to a using unit. When bulk supplies are received in damaged containers or containers unsuitable for proper storage, issue, or shipment, or shipment, repacking and re-marking should be done during the receiving operation to expedite and simplify issuing.

(2) Marking for shipment. A portable conveyor assembly and placed in any empty storage location makes a good platform for marking a shipment. A forklift truck can deliver the supplies to one end of the conveyor. The boxes are placed on the conveyor and marked by the assembly-line method. Each man/woman along the line applies the marking assigned and pushes the box along to the next man/woman. The boxes are placed on pallets as they come off the marking line; they are taken either to an assembly location for the shipment, or to the carrier if the carrier has been spotted.

(3) Assembly for shipment. When you are shipping carload or truckload shipments of the same item, the carrier is spotted at the nearest door and loaded. Some bulk shipments of different items may require the carrier to move to several warehouses to be loaded. However, in some instances it is better to assemble the shipment at one warehouse location to speed up the loading procedure and to release the carrier's equipment within the prescribed free time limits.

e. Loading the carrier. After the freight has been prepared for shipment, properly marked and documented, assembled for loading, and the loading equipment assembled, loading should begin upon arrival of the carrier and should continue speedily and skillfully. The material should be loaded according to plan; that is, properly blocked, braced, and loaded so that it will not have to be partly or wholly unloaded to correct something that has been overlooked. The following principles should be applied to the handling of outgoing supplies: Straight-line flow (movement of materials between any two points should travel by way of the shortest distance); concentrated operation (operations spread over too large an area cause problems in handling and supervision); and minimum handling. A loading operation will be influenced by several factors: personnel and equipment available, carrier's equipment furnished, characteristics of the material being loaded, and the time limitation on the operation. Once a loading operation has begun, the operation should be so planned that all persons are fully engaged in the operation.

(1) Spotting the carrier. When the request for a truck or rail car is submitted to the freight office, specific information for spotting the equipment is included. When supplies must come from different warehouses, the carriers equipment is sometimes spotted at different locations rather than being held at the single loading point. By spotting cars or trucks as near the storage location as possible, the hauling distance of supplies is reduced with man-hours and equipment saved.

(2) Inspecting the carrier. The vehicle should be checked for weak flooring, leaky overheads, and other structural defects. Insect infestation or the presence of contaminating odors may also make the carrier unsuitable for loading. Infested vehicles or those containing contamination of any type should not be loaded if these conditions will affect the supplies to be loaded.

(3) Moving and loading the supplies. Palletization is the modern approach to materials handling and is an important step in efficient transportation. Palletization is a system whereby items are grouped into a unit load for handling by mechanical means, such as a forklift truck. The efficiency gained by reducing the number of handlings is obvious in the example of loading a freight car with 1,800 small boxes. By grouping the boxes on 36 pallets, each containing 50 boxes, the numbers of transfers is reduced from 1,800 individual box handlings to 36 mechanized moves. Furthermore, each separate handling of a package increases the possibility of damage, while reducing handling results in less damage to supplies. Supplies should be moved from the storage location into the carrier employing the most appropriate methods available. The equipment used may be either manually operated, such as conveyor lines, pallet trucks, warehouse trucks, or handtrucks; or it may be powered, such as forklift trucks or tractor-trailer trains.

(4) Tallying the shipment. Shipments are tallied by the checker and loaded. The tally count may made by either of the following methods. The use of either method will ensure that the complete shipment is loaded.

(a) If the containers are numbered, the checker numbers the border of the shipping document, then draws a line through the numbers as each container is loaded.

(b) If the containers are not numbered, the checker makes a stroke mark on the reverse side of the document as each container or pallet load is placed into the carrier.

f. Document disposition. After the supplies have been loaded, the various documents related to the issue and shipment must be distributed properly. The shipping papers are routed to the transportation office. The retained copy of the issue document is routed to the locator file clerk if locations were deleted, then to the stock control section for recording and filing.

BASIC WAREHOUSING

Lesson 2

Stock Location and Materials Handling Procedures

STUDY ASSIGNMENT: MCI 30.1k, Basic Warehousing, Chap 2.

LESSON OBJECTIVE: To familiarize you with the basic principles and procedures in the location and handling of supplies, and with the commonly used materials handling equipment.

WRITTEN ASSIGNMENT:

A. Multiple Choice: Select the ONE answer which BEST completes the statement or answers the question. After the corresponding item on the answer sheet, blacken the appropriate circle.

Value: 1 point each

1. A stock locator card is maintained for each

   a. storage lot.
   b. storage location.
   c. bin location.
   d. item in stock.

2. From a stock locator card, you can determine an item's location, stock number, and

   a. unit price.
   b. unit of issue.
   c. quantity on hand.
   d. account code.

3. How many locations are maintained for a stock-numbered item stored in bins?

   a. 1
   b. 3
   c. 6
   d. 12

4. The main purpose of a stock location system is to help you

   a. determine which items to put in bins.
   b. locate empty locations.
   c. find all items.
   d. determine the quantity of an item in a specific location.

5. The stock location numbering system consists of an alpha and numeric combination of _____characters.

   a. 9
   b. 10
   c. 11
   d. 12

6. Of the following, which could be an actual stock location number?

   a. C 15 33 96 93
   b. C 15 33 96 9K
   c. C 15 33 96 K9
   d. C 15 33 96 F"

NOTE: Items 7 - 12 are based on the following stock locator number: B 21 34 15 EC.

7. The characters 21 identify a(an)

   a. aisle.
   b. area.
   c. segment.
   d. station.

8. The area is identified by the character/characters

   a. B.
   b. C.
   c. E
   d. EC.

9. The last character identifies a

   a. compartment.
   b. level.
   c. segment.
   d. station.

10. The character E identifies the

a. area.
b. compartment.
c. level.
d. station.

11. The segment is identified by the character/characters

a. 15.
b. 21.
c. B.
d. EC.

12. The characters 34 identify a(an)

a. aisle or row.
b. area.
c. level.
d. segment.

13. The stock locator file is maintained by the

a. stock control section.
b. storage section.
c. inventory section.
d. freight traffic office.

14. The locator file is maintained in sequence by _____ number.

a. stock
b. location
c. lot
d. part

15. Which data does a warehouseman enter on a receiving document?

a. Stock number
b. Unit of issue
c. Phrase code
d. Location number

16. When items are relocated, the locator obtains new machine-produced locator cards by submitting a

a. key punch notice.
b. memorandum.
c. manually prepared locator card.
d. copy of the relocation order.

17. When all stock is exhausted from a bin storage location, you should

a. replenish the item from bulk stock.
b. remove the locator card and destroy it.
c. notify the stock control section.
d. submit a requisition for replacement.

18. After the locator file has been processed with the change card deck, changes made are indicated in the

a. deck of new locator cards.
b. deck of cross-reference locator cards.
c. machine-produced listing.
d. deck of old locator cards.

19. Who should take corrective action when errors are found during wall-to-wall verification of locations?

a. Locator file clerk
b. Inventory officer
c. Supply officer
d. Person finding the error

20. When a wall-to-wall location verification is held, which data should be checked?

a. Stock number
b. Unit of issue
c. Location number
d. All of the above

21. In determining the method of moving supplies, you should first consider the _____ of the items to be moved.

a. size
b. shape
c. value
d. number of pieces

22. The weight of packages to be handled manually should not normally exceed

a. 15 lb.
b. 25 lb.
c. 40 lb.
d. 50 lb.

23. The forklift truck is most efficient when used for

a. unloading railcars.
b. relocating supplies.
c. moving loads 400-feet or more.
d. stacking supplies.

24. Pallet loads of supplies should be moved by forklift truck when the moving distance ranges from

a. 10 to 400 ft.
b. 400 to 500 ft.
c. 500 to 600 ft.
d. 600 to 800 ft.

25. The tractor-trailer train should be used for moving large quantities of material if the distance is more than

a. 100 ft.
b. 200 ft.
c. 300 ft.
d. 400 ft.

26. The most desirable height for a palletized unit load constructed on a 40- x 48-inch pallet, including the pallet, is

a. 44 in.
b. 48 in.
c. 52 in.
d. 53 in.

27. Which operation involves planning, spotting the carrier, unloading the carrier, and moving the supplies to storage?

a. Stock relocation
b. Shipping
c. Receiving
d. Issuing

28. To obtain information on rail cars spotted during a previous month, you should consult the

a. storage section.
b. space utilization office.
c. stock control section.
d. freight traffic office.

29. An advance copy of a shipping document would give you what kind of information?

a. Obligation
b. Due-in
c. Shipping
d. Location

30. To find an item in your warehouse, you should check the NSN against the

a. planograph.
b. bin sections.
c. locator file.
d. bulk storage area

31. You receive supplies which require repacking. When should this repacking be done?

a. During the unloading operation
b. Immediately before the supplies are issued
c. During slack periods in the normal work schedule
d. During a specially scheduled period

32. A unit load may be correctly defined as

a. a fully loaded truck or rail car.
b. the maximum weight transportable by an individual.
c. one or more items handled as a unit.
d. a platform for storing supplies.

33. The maximum size of a unit load being shipped on a 40- x 48-inch pallet is

a. 40" x 48".
b. 42" x 48".
c. 43" x 52".
d. 43" x 56".

30.1
lsn 2;p. 3

34. Which supply accounting section records and files receiving and issue documents?

a. Inventory control
b. Stock control
c. Transportation
d. Storage

35. The final step in warehousing operations is

a. issuing.
b. receiving.
c. storage.
d. relocation.

36. What determines issue priority in the workload of the storage section?

a. Volume of work
b. Availability of the item
c. Date the supplies are required by the requesting activity
d. Amount of equipment required to move the material

37. An issue document received by the storage section is first routed to the

a. locator file clerk.
b. stock picker.
c. packaging and packing section.
d. transportation section.

38. The weight and cube of supplies to be shipped should be furnished to the

a. stock control section.
b. freight traffic office.
c. space utilization office.
d. inventory control section.

39. To go down a ramp with a loaded forklift truck, you should

a. back down.
b. drive down forward.
c. tilt the forks back and drive down forward.
d. tilt the forks forward and drive down.

Total Points: 39

* * *

CHAPTER 3

PRESERVATION AND PACKING PROCEDURES

Section I: INTRODUCTION TO PRESERVATION AND PACKING

3-1. PURPOSE AND IMPORTANCE

Rough handling and exposure to extreme climatic conditions are two common problems faced with in the moving and storing of military supplies and equipment. In view of this, the Armed Forces have given much time and thought to the development of methods to protect material against deterioration and damage. Material damaged due to improper preservation or packing will be of little value to the using unit, which is the organization most directly concerned. Everything that the using troops receive must be ready for immediate use. In view of the needs stated above, the Department of Defense Instruction 4100.14 was issued. This instruction established the general policies for the uniform and economical packaging of material. Marine Corps policy on this subject is stated in MCO P4030.36. Detailed instructions to accomplish the requirements of this policy are provided in MCO P4030.21, Volume II and MCO P4030.31, Volume I.

Section II. Packaging

3-2. PACKAGING OPERATIONS

a. Definition of packaging. For the purpose of this course, packaging means the processes and procedures used to protect material from deterioration and/or damage. (It includes cleaning, drying, preserving, packing, marking, and utilization.)

b. Definition of preservation. Preservation is the application of unit protective measures, including cleaning, drying, preservative materials, and containers when necessary.

c. Sequence of operations. Preservation involves the performance of some or all of the following operations, depending on the item to be processed (fig 3-1). You should become familiar with the basic requirements and sequence of operations involved in the preservation of an item.

Fig 3-1. Operations involved in unit preservation.

(1) Cleaning. All substances (contaminants) which would cause or promote corrosion must be removed.

(2) Drying. This must be done immediately after cleaning to remove cleaning solutions or any other remaining moisture to prevent corrosive action.

(3) Preservation application. Preservatives are materials that are applied to items to protect them from deterioration. Contact preservatives protect items by providing a barrier against moisture air, and other agents of corrosion. Other preservatives protect items by releasing vapors which deposit an invisible protective film on the items. These materials are called volatile corrosion inhibitors (VCI's).

(4) Wrapping and/or cushioning. Appropriate wrapping is used to retain the preservative on the item and prevent disruption of the coating applied. Cushioning is used to protect the item against physical and mechanical damage and to protect materials and containers against punctures.

(5) Packing (placing in container). Preserved items are placed into unit, intermediate and/or exterior containers, as applicable, to provide supplemental protection that may be required for shipment, handling, or storage. The packing operation includes necessary blocking, bracing, weather-proofing, reinforcement and marking.

(6) Marking. Appropriate markings must be applied to provide proper identification and assure safe delivery.

d. Closeness of operations. The first five operations listed above must follow one another as closely as possible to avoid recontamination of the item. Metal parts which have been thoroughly cleaned are more likely to corrode than parts left in their original condition.

e. Source of additional information. Detailed instructions on the above operations are contained in MCO P4030.31.

3-3. LEVELS OF PROTECTION

To help determine the extent of packaging to protect an item against specific hazards of storage, transportation, and handling, the Department of Defense has established two levels of protection whose main objectives are to provide uniform, efficient, and economical protection to supplies and equipment (fig 3-2). These levels of protection are based upon the performance expected of the pack. The performance criteria can be summarized as follows:

a. Level A, maximum protection. This level of preservation and packing must provide protection against the most severe conditions known or anticipated to be encountered during shipment, handling, and storage. Preservation and packing designated level A is designed for direct exposure to all extremes of climatic, terrain, operational, and transportation environments without protection other than that provided by the pack. Items preserved and packed using this level of protection should withstand multiple rough handling during transportation, shock, vibration, and static loading during shipment, exposure to the environment during transit where warehouse facilities are limited or nonexistent, and during extended periods of unimproved open storage in all climatic zones, particularly while under static loads imposed by stacking.

b. Level B, minimum protection. Level B is the degree of preservation and packing required for protection under known favorable conditions during shipment, handling, and storage. Preservation and packing designated level B will be designed to protect items against physical and environmental damage during known favorable conditions of shipment and storage.

c. Industrial Packaging. Industrial packaging will be used whenever logistic conditions justify and may be used to satisfy any degree of protection of the package when design details are met. ASTM-3951-82 is an acceptable reference document for industrial packaging.

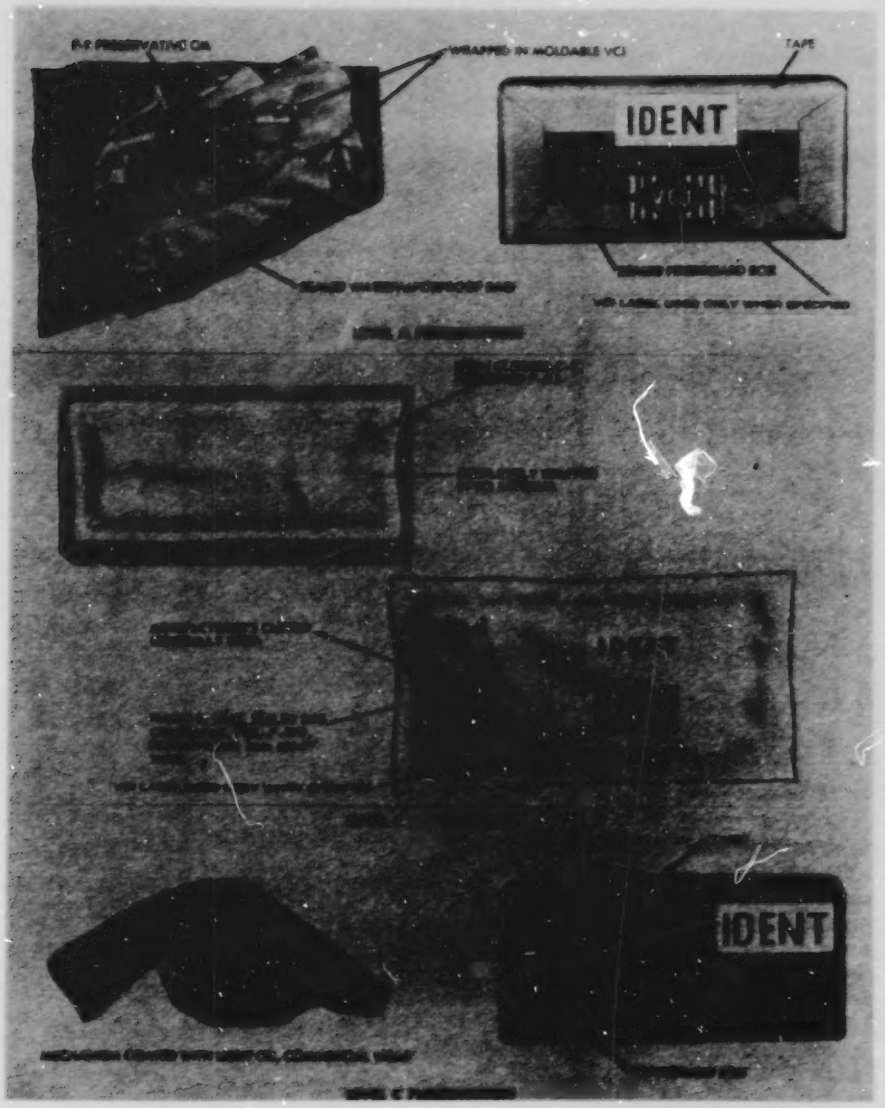

Fig 3-2. Levels of preservation and packing.

3-4. METHODS OF UNIT PROTECTION

a. Introduction. Remember that each unit pack you create must protect the item until the pack is opened at its final destination. Unit protection is the proper application of the methods and materials to help ensure that cleaned, dried, and preserved items remain in a usable condition during overseas shipment or long-term storage. Unit protection helps prevent damage caused by weather hazards such as extreme cold, ice, snow, dry intense heat, rain, high humidity, and air-pressure changes. It also lessens abrasion, shock, and impact caused by handling and shipping hazards. Each operation of unit protection is equally important and should be followed by the next operation with a minimum of delay. Knowledge of the following terms and definitions is necessary to the understanding of unit protection.

(1) Unit preservation. Unit preservation is that protection given to an item or items through the application or use of appropriate wrappings, cushioning, interior containers, and marking for identification, preceded by any necessary cleaning, drying, and application of preservative coatings.

(2) Unit Pack. A unit pack is the first tie, wrap, or container applied to a single item or a quantity thereof, or to a group of items of a single stock number, preserved or unpreserved, which constitutes a complete or identifiable pack (fig 3-3).

Fig 3-3. Examples of unit packs.

(3) Intermediate protection. Intermediate protection is that protection given to two or more identical unit packs by placing them inside an interior container, thus giving added protection and helping to make handling easier.

(4) Intermediate pack. An intermediate pack is a wrap, box, or bundle which contains two or more unit packs of identical items.

(5) Exterior pack. A container, bundle, or assembly which is sufficient by reason of material, design and construction to protect material during shipment and storage. This can be the unit pack or a container with any combination of unit or intermediate packs.

(6) Unitization. This is the assembling of packs of one or more line items of supply into a single load in such a manner that the load can be handled as a unit and moved in an unbroken state through the distribution system.

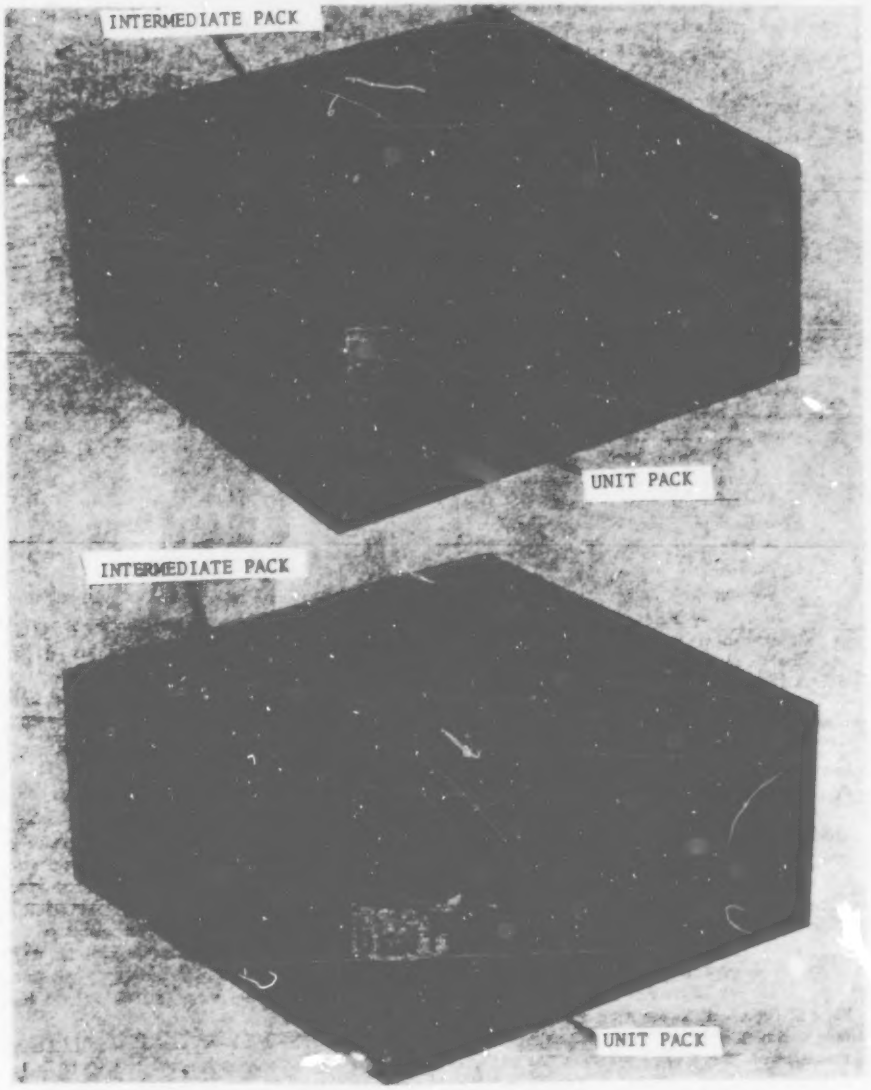

Fig 3-4. Examples of intermediate packs.

b. Factors governing the selection of the method of unit protection. The four factors governing your selection of the method of unit protection are:

(1) Composition of the item--whether the item is made of metal or non-metal or a combination of both.

(2) Nature of the item--whether the item's surface needs a minimum or maximum amount of protection, and the effect of water and water vapor on the item.

(3) Construction of the item--whether the item is simple or complex in construction.

(4) Level of preservation required--whether the item is to be packaged level A or B requirements.

c. Basic methods of unit protection. Illustrated in figure 3-5 are the six basic methods whereby military items can be packaged. These methods are identified by uppercase Roman numerals and capital letters as follows:

(1) Method I - Preservative coating (with greaseproof wrap as required).

(2) Method IA - Water-vaporproof enclosure (with preservative as required).

(3) Method IB - Strippable compound coating (hot dip).

(4) Method IC - Waterproof barrier (with preservative as required).

(5) Method II - Water-vaporproof barrier with desiccant (with contact preservative when required).

(6) Method III - Packaged for physical and mechanical protection only.

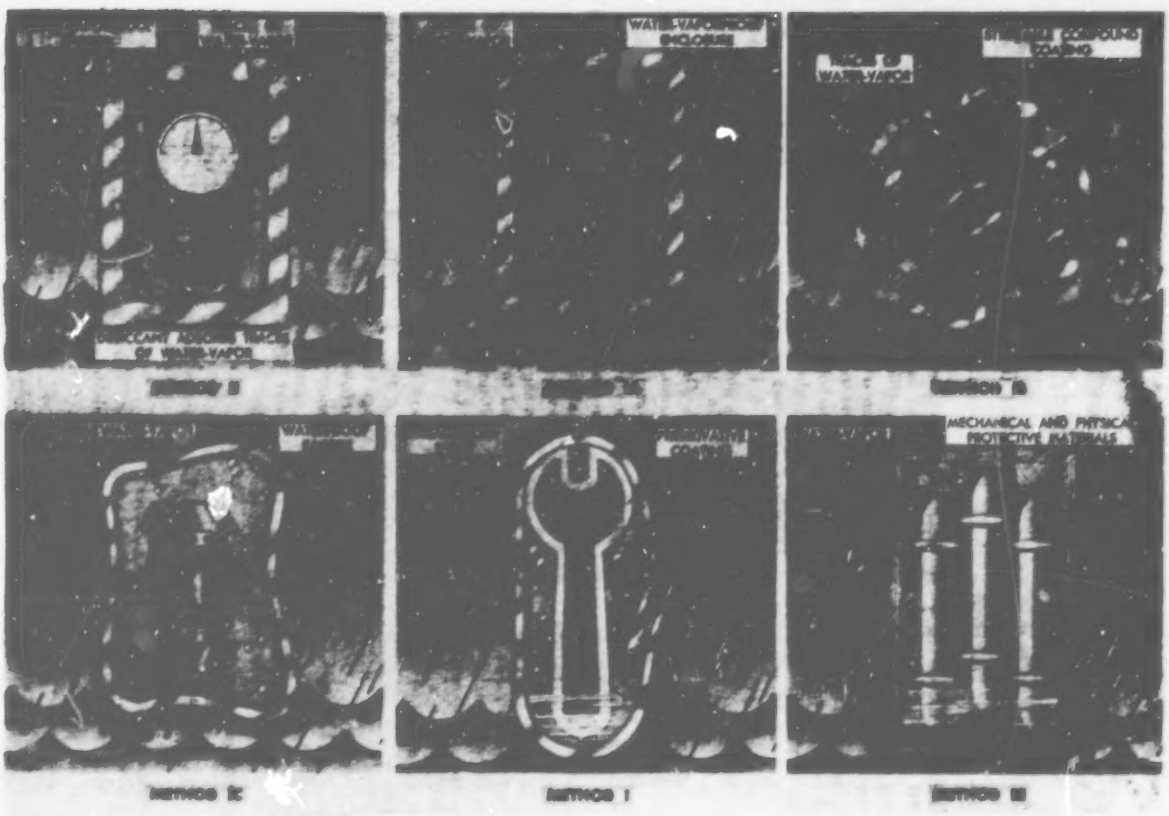

Fig 3-5. Basic methods of unit protection.

d. Submethods of unit protection. There are 22 submethods of unit preservation for a total of 23 different ways of making unit packs (basic methods I and III have no submethods). The submethods are indicated by lower case letters or numbers added to the basic method number. Some examples and the number of submethods each basic method has are:

Basic method	Submethod
Method IA(7 submethods)	Submethod IA-8
Method IB(2 submethods)	Submethod IB-2
Method IC(7 submethods)	Submethod IC-1
Method II(7 submethods)	Submethod IIa

e. Sources of additional information. The general requirements for each method and submethod of unit protection are given in MIL-P-116H. Detailed information on the application of all methods and submethods is located in MCO P4030.31.

Section III. PACKING

3-5. PACKING OPERATIONS

Since unit preservation alone cannot provide all the protection needed for the shipment and storage of military items, it must be supplemented by adequate packing. Packing is defined as the assembly of items into a unit, intermediate, or exterior pack with necessary blocking, bracing, cushioning, weather-proofing, reinforcement and marking. Any military packing operation involves some or all of the following steps (fig 3-6).

a. Determining packing requirements.

b. Selection and use of exterior shipping containers.

c. Assembling of items or packs into the container.

d. Blocking, bracing, or cushioning the items or packs within the container.

e. Weatherproofing the contents.

f. Strapping the container.

g. Marking the container for identification of contents.

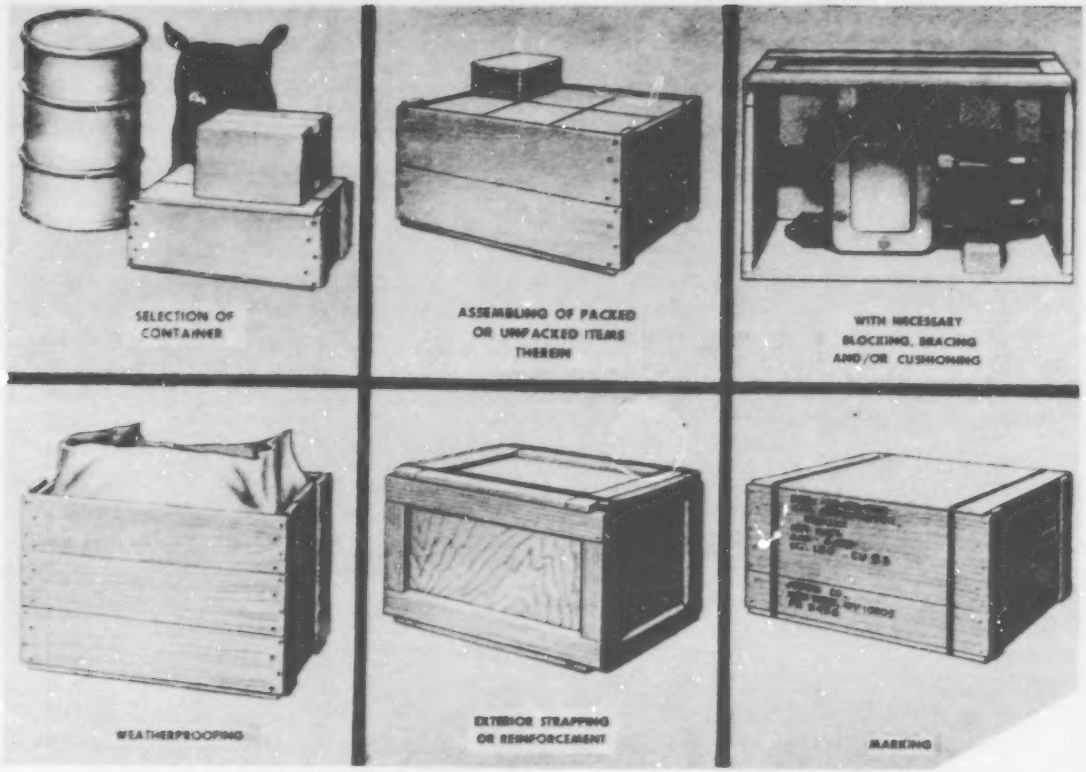

Fig 3-6. Operations involved in packing.

3-6. PACKING REQUIREMENTS

a. General packing requirements. Briefly stated, the packing policy of the Department of Defense consists of the following:

(1) Protection required. All military supplies and equipment must be given the degree of packing necessary to prevent their deterioration or damage due to the hazards common to shipping and storage operations.

(2) Source of requirements. Packing requirements must conform to military requirements of specifications, standards, and other authorized instructions. The marking of shipping containers must be in accordance with applicable standards, specifications, and other authorized instructions.

b. Determining specific packing requirements. The first step in any packing operation is a careful study of the item to be packed. Among the most important factors to consider are the item's shape, size, weight, strength, and composition. You must also consider whether the item should be disassembled and whether any special packing requirements apply.

3-7. LEVELS OF PACKING

The levels of military preservation and the criteria applicable to industrial packaging discussed in paragraph 3-3 are equally applicable to packing of unit and intermediate containers. Packing requirements for exterior containers or unitization of items for shipment or storage are as follows (fig 3-7):

c. Containers and materials used in level A packing must provide adequate protection for all modes of shipment, intermediate and/or outdoor storage, rough handling and world-wide distribution.

b. Containers and materials used in level B packing must be adequate for multiple domestic shipments, protected oversea shipment and favorable warehouse storage.

c. Containers used for commercial distribution (Industrial packaging) are considered adequate protection of material to the first destination (domestic) and for containerized oversea shipments.

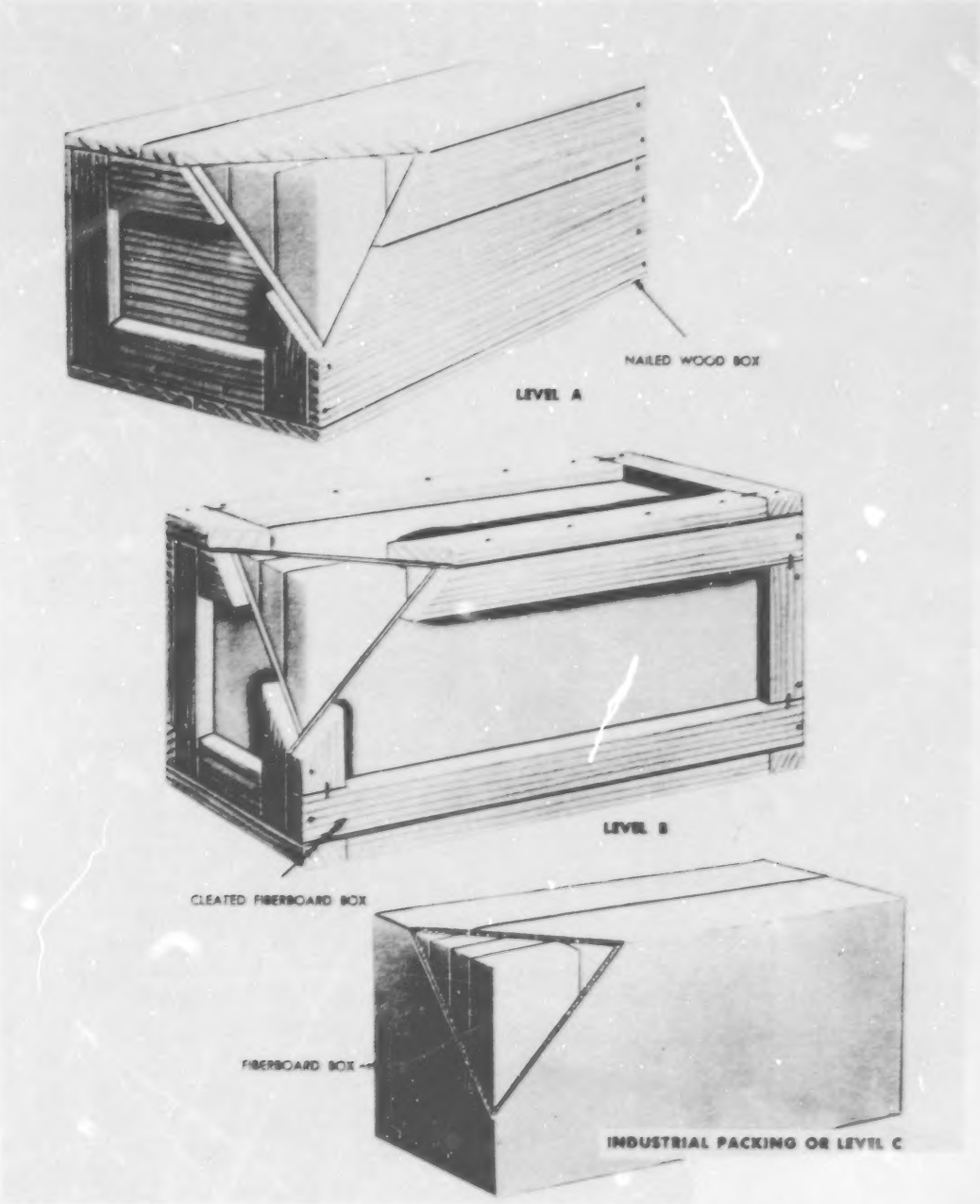

Fig 3-7. Levels of packing.

3-8. TYPES OF LOADS

In packing operations, the proper selection of the shipping container for a given load is very important. The design of the shipping container to be used is influenced by the type of load. The term "type of load" refers to the physical characteristics of an item, including the nature of the item as it contributes to the support of, or damage to, the container. The types of loads (fig 3-8) fall into the following three categories:

a. Type 1 (easy load). This load involves a single item or single interior container which provides complete and uniform support to all faces of the shipping container. The contents are of moderate density and are relatively sturdy. Examples are wood or metal chests, tool kits, and canned or boxed articles which are prepacked in a fiberboard box that completely fills the outer shipping container.

b. Type 2 (average load). This load is composed of more than one item or interior container which gives some support to all faces of the shipping container. The contents are of moderate density and are relatively sturdy. Examples are goods in metal cans which are not prepacked in an inner container, bottles individually cushioned, hardware in cartons, etc.

c. Type 3 (difficult load). This load gives little or no support to the shipping container. The contents can be extremely heavy, very fragile, very irregular in shape, bulk materials which are free to shift and flow, or a combination of several of these factors. Examples are rivets, bolts and nuts, delicate instruments, machined parts and assemblies, etc.

Fig 3-8. Types of loads.

3-9. SELECTION AND USE OF CONTAINERS

a. The selection of an exterior container is usually established by specifications, directives, technical orders, or other authorized publications. If you are required to select the proper container, you must consider such factors as the physical characteristics of the item to be packed, its destination, the type of load, the initial cost of the container, the simplicity, economy and ease of assembly and closure, the availability, and the need for reusability of the container (fig 3-9). Weight is one of the most important of the factors.

Consequently, when the choice falls between the use of two or more different containers, each offering the same degree of protection, you should choose the container that will keep tare weight and cube to a minimum. Tare weight is the weight of the container only; cube refers to the amount of space occupied by a container, generally expressed in cubic feet. Because of the high tare weight, nailed wood boxes or similar wooden containers should not be used unless they can be fully justified based on past shipping experience of the item or anticipated logistical factors, such as handling, environmental, and storage conditions. Among the most commonly used standard shipping containers employed by the military services are:

(1) Nailed wood boxes.

(2) Sheathed and unsheathed crates.

(3) Fiberboard boxes.

(4) Wirebound wood boxes.

(5) Cleated panel boxes.

(6) Triple-wall corrugated fiberboard boxes.

(7) Metal containers.

b. After selecting the proper container, you are ready to assemble the items or packs into the container. According to the amount of protection required for the item, type of load, destination, etc, you must accomplish any necessary blocking, bracing, cushioning, weatherproofing, or strapping. Only then are you ready to perform the important task of marking the container for shipment or storage.

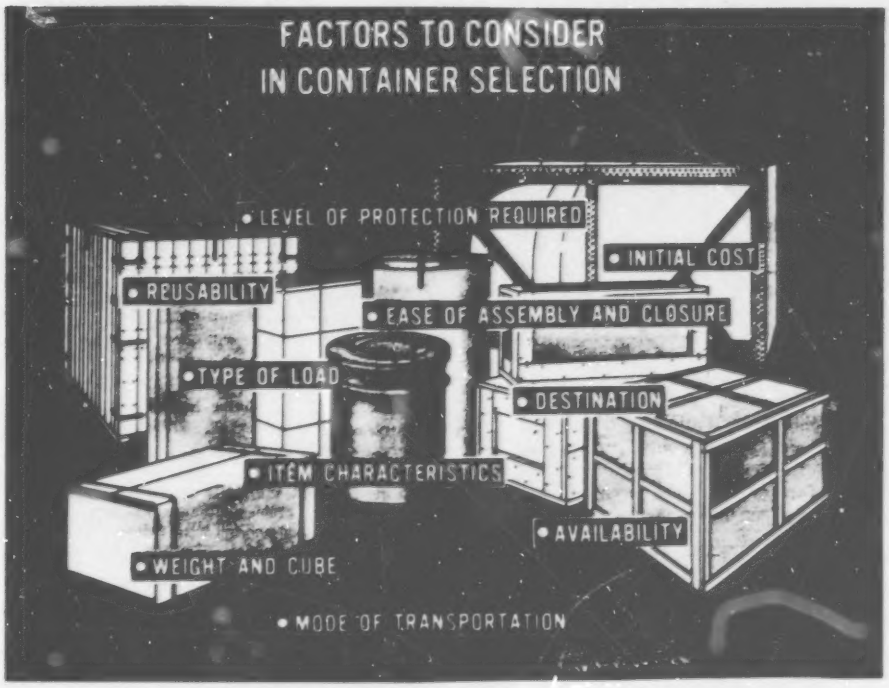

Fig 3-9. Container selection factors.

3-10. PARCEL POST PACKING REQUIREMENTS

Delivery of material through normal military supply channels is often slow. The ability of the postal system to provide rapid delivery of high priority items, including repairable and replacement items, makes parcel post service invaluable to the Armed Forces. Since parcel post shipments do not travel through the Defense Transportation System, documentation and marking requirements are greatly reduced, thereby saving considerable time and money. Policy criteria for packaging are contained in MCO 2740.1 . Chapters one and two of the Postal Manual contain the procedures, rules, and regulations for shipping items by parcel post. Some of the regulations you must follow are:

a. Containers. Any container, capable of meeting postal regulations and strong enough to retain and protect its contents from the weight of other mail and manual or mechanical handling equipment while in postal channels, may be used for parcel post shipments. Cushioning is used to protect the item and container form damage during shipment and handling. Some common containers that are used are cotton mailing bags, cushioned paper shipping sacks, fiber drums, fiberboard boxes, pallet type wirebound wood boxes, and polyethylene molded plastic drums. A used fiberboard box in good rigid condition may be used when available. Postal Service mailbags may be used as containers for consolidated shipments of unbreakable or non-fragile items going to the same location if projections are cushioned to prevent rupture of e bag during shipment.

b. Size and weight limitations

(1) Packages mailed from a first class post office in the United States, addressed to another first class post office in any of the 48 adjoining states, are limited to not less than one pound and not exceeding 40-pounds. The combined length and girth cannot exceed 84-inches.

(2) Packages, other than air mail, are limited to at least one pound but not more than 70-pounds and 108-inches in length and girth combined when mailed at or to:

(a) Any second, third, or fourth class post office.

(b) Any Army, Air Force, or Fleet Post Office.

(c) Any post office in Alaska, Hawaii, the Commonwealth of Puerto Rico, or in a territory or possession of the United States.

(3) Air mail parcel post, regardless of class of post office involved, can be 70-pounds in weight and 100-inches in length and girth combined.

(4) To compute the size of a parcel (fig 3-10), measure the longest side to get the length, measure distance around the parcel at its thickest part to get the girth, then add the length and girth together.

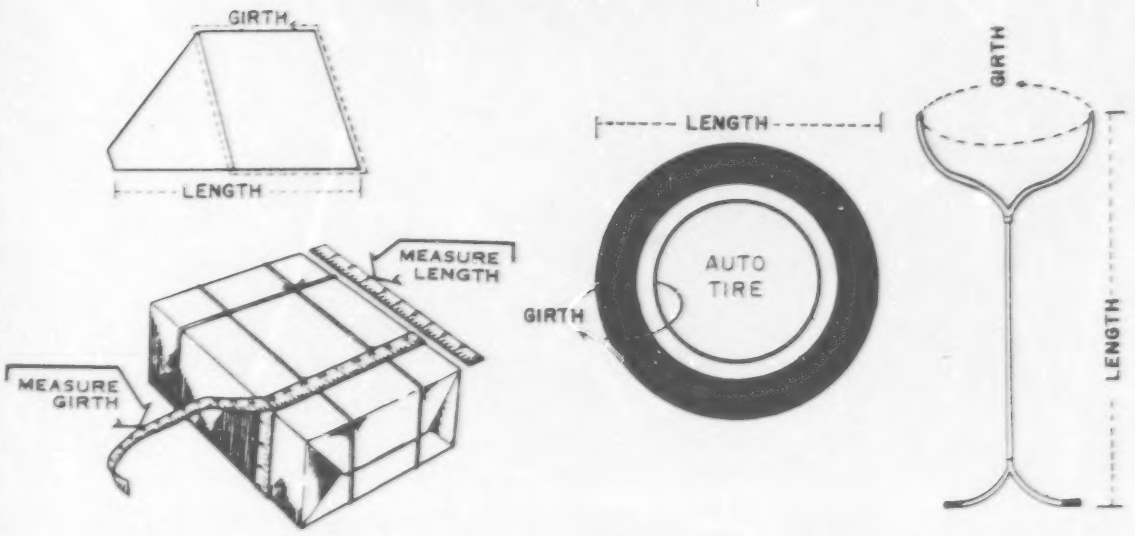

Fig 3-10. Postal Service measuring requirements.

c. Marking. All packages must be marked to show the official mail indicia (Penalty wording, etc), the return address of the shipper, the in-the-clear address of the requisitioner, and the required delivery date (RDD) or the preferred delivery date (PDD). If the item is to be shipped by commercial air, it must be marked "AIRMAIL" in addition to the above required markings. This must be placed on the address side of the package below the "Postage and Fees Paid" imprint, and also on the top, bottom, and sides of the package. Mailbags should be tagged on the space located on the locking device which is used to prevent the mailbag from opening in transit. The wording on the tag should read "Official Mail for Organization of Address, DO NOT OPEN IN TRANSIT." In addition to the tag placed on the locking device, two additional tags should be attached to the bag. One tag notifies local postal authorities that the bag is to be delivered intact to its destination and the other contains he complete address for which the bag is destined, the return address, the notice of "Postage nd Fees Paid," and the name of the military service making the shipment.

3-11. MARKING FOR SHIPMENT AND STORAGE

a. Introduction. The purpose of marking is to provide movement of supplies without confusion and delay, and to permit ready identification of contents of packs at transshipping points or at destination. No matter how well an item is made, preserved, or packed, it is valueless if it cannot be identified upon reaching its destination. The basic publication for the marking of military supplies is Military Standard 129, "Marking for Shipment and Storage." Its use is mandatory for the military services and Department of Defense supply agencies.

b. Marking materials. All marking materials used must be as specified in MIL-STD-129 or be approved by proper authority. Marking materials may divided into waterproofing materials, obliterating materials, stenciling materials, and labels, or tags.

(1) Waterproofing materials

(a) Spar varnish. This is a very durable, waterproof utility varnish that is used to protect and waterproof markings and labels. It is suitable for use in both open and covered storage areas.

(b) Acrylic coating compound. This coating compound is clear and water-resistant. It serves the same purpose as spar varnish and also prevents corrosion on metal surfaces.

(c) Adhesive and sealing compound, cellulose nitrate base. This material is used to apply labels to cbntainers and to waterproof them. The dual purpose of this material makes it ecpnomical and handy to use.

(d) Adhesive, paper label, water-resistant. This is a waterproof material used to secure and waterproof labels and to waterproof tags and markings.

(e) Adhesive, paper label, water-resistant, water emulsion type. This adhesive is used to waterproof labels and to secure them to rigid surfaces. It is used in locations in which the toxicity and flammability of comparable adhesives of the organic solvent type would be objectionable.

(2) Stencil materials

(a) Stencil inks. These inks are weather-resistant, fast drying , and have a flat finish. They are made in black, white, red, gray, yellow, green, blue, and orange colors. They come in two types, one for use on porous surfaces such as wooden boxes, cartons, etc, and one for nonporous surfaces such as metal and glass.

(b) Stencil lacquer. This material is weather-resistant and fast drying. It is intended for use on primed metal surfaces, preferably zinc-chromate primed.

(c) Stencil enamel. This is a synthetic gloss enamel that is weather-resistant and fast drying. This enamel is suitable for use on exterior and interior wood and smooth metal surfaces which have been previously primed.

(d) Gasoline-soluble paint. This paint is used when markings are applied directly to unboxed and uncrated equipment such as vehicles. At destination the markings can be removed with the use of gasoline.

(3) Obliterating material

(a) Lacquer, lusterless, obliterating. This is a sand-colored, quick drying lacquer used to cover old markings on shipping containers and also to cover dirty or discolored surfaces to which markings are to be applied. In addition to its good covering qualities, it helps provide good legibility to the markings applied over it.

(b) Enamel, alkyd, lusterless, quick drying. This is a sand-colored, quick drying enamel used in the same manner and for the same purpose as the above lacquer.

(c) Paint, water emulsion type. This material is used for both obliterating and stenciling. In lieu of this material a quick drying opaque paint, approximating the color of the container, may be used when approved by the proper authority.

(4) Tags and labels

(a) Tags. Unless otherwise specified, cloth and paper shipping tags must be either white or manila color. Metal shipping tags must be corrosion-resistant. Markings applied to the cloth and paper tags must be printed with waterproof ink or typed, and metal tags must be marked by the use of dyes or punches. Maximum size of tags is 28-square inches. They should be attached to items with corrosion-resistant wire or twine.

(b) Labels. Labels must be made of white paper, have a smooth finish, and be no larger than 28-square inches. They may be used on interior packages, paper-wrapped rolls, unpacked items, and, under certain conditions, on shipping containers. Labels must be securely fixed in place with water-resistant adhesive. Labels for level A packs must be waterproofed by coating the entire surface with waterproof lacquer, clear acrylic coating compound, varnish, or label adhesive, ensuring that the coating does not blur or smear the markings. Labels for level B packs and industrial packaged items do not require the protective coating.

c. Marking requirements. Marking of interior packs, unpacked items, and exterior packs (boxes, crates, miscellaneous packs, barrels, drums, bales, etc) must be done by use of labels, stamping, stenciling, printing or tagging. Lithographing, silk-screening, photo marking, embossing, decals, transfers, or other similar processes may be used when approved. Except for yardage marking of textiles, piece number, total pieces, and weight and cube information, hand lettering or writing must not be used unless specifically authorized.

(1) Condition of surfaces to be marked. All surfaces to be marked must be clean and free of oil, grease, and marks not applicable to the shipment. Advertising matter and case markings, not interfering with the required markings, are permitted. The required markings must be of a different color than the advertising matter when they cover part of the advertising.

(2) Legibility. Markings must be clear, legible, nonfading, and durable. The color of all markings must be black, except when applied to surfaces on which black is not legible, then the color used should provide a definite contrast. For example, yellow or white lettering must be applied over lusterless, olive-drab coloring on metal drums.

d. Size of markings

(1) Unless specified otherwise in MIL-STD-129, lettering for all markings must be capital letters of equal height and proportional to the available space of the container.

(2) Lettering for markings other than the address should not be less than 7/16 nor more than 1-inch in height. If available space does not permit the use of larger size marking, the lettering may be reduced to 1/4-inch.

(3) Lettering for address markings on labels or tags must not be less than 10-point type(.095-inch; approximately 3/32-inch). On metal tags, the minimum size marking is 3/16-inch.

e. Identification markings. Identification marking is basic and must appear on all containers, palletized unit loads, and unpacked items as required for a particular pack. Refer to figure 3-11 for illustration of identification markings.

(1) National stock number/NATO stock number. When no NSN/NATO stock number is available, the applicable federal supply classification (FSC) code, if known, should be shown. In addition, the manufacturer's part number should be used, and a space left blank immediately above the number for subsequent placement of the NSN/NATO stock number.

(2) Item description. This marking is the exact name and description of the item as it appears in the contract, purchase order, or requisition. It will usually consist of the basic item name and one or more descriptive adjective(s).

(3) Quantity and unit of issue. The quantity is the number of items in the unit pack, intermediate pack, shipping container, bundle, or secured lift. The unit of issue is a standard or basic quantity in which an item of supply is divided, issued, or used.

(4) Level of preservation and date. This marking consists of the level of preservation and packing, and the month and year of the earliest package date.

(5) Gross weight and cube

(a) The gross weight is the total combined weight of the item, container, and any dunnage used. It is shown numerically to the nearest whole pound.

(b) The cube is the cubic displacement of the shipping container, bundle, or secured lift, calculated by multiplying the extreme overall length by width by height dimensions. Irregular, round, or cylindrical items are calculated as rectangular solids. Cube is shown in cubic feet expressed decimally to the nearest one-tenth of a cubic foot; i.e., 5.2, 7.8, 10.4, etc.

(6) Outside dimensions. Outside dimensions must be shown on all shipping containers, bundles, or secured lifts having any single dimension of 72-inches or over. These dimensions are shown in order by length, width, and height in inches to the nearest inch. Dimensions are in addition to the cube, and should be located below the above listed data when required.

(7) Contract data markings. Contract data markings are standard and are applicable to all containers originating with the contractor. They consist of the contract, purchase or delivery order number, and the name and address of the contractor.

(8) Packing list. A packing list is used on containers or unitized loads packed with unlike items when a full description is not authorized or cannot be shown on the container. One copy of the list must be placed loose inside the container on top of the contents, sealed inside a waterproof liner or a water-resistant envelope. A second copy should be placed inside a water-resistant envelope and securely attached to the outside of the container in the most protected location. For oversea shipments, the waterproof envelope should be further protected with a packing list protector securely attached to the container. The words "PACKING LIST" must be embossed or imprinted on the outside face of the protector with waterproof black or red ink in letters not less than 3/4-inch high. Tacks or staples must not be driven into the envelope in such a manner as to fasten or bind the packing list, or be of such length that they penetrate the shipping container.

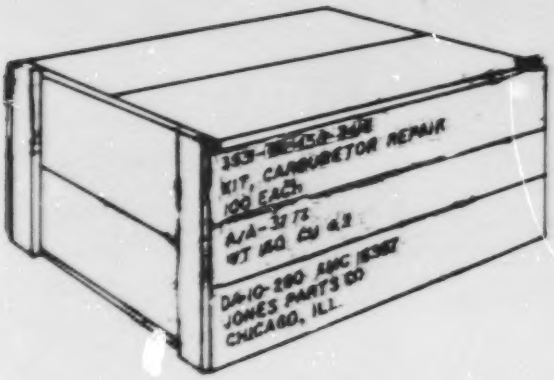

Fig 3-11. Identification and contract markings.

f. Address markings. Address markings should be applied to shipping containers by means of a Military Shipment Label (DD Form 1387) or a Military Shipping tag (DD Form 1387-1), using a blue-bordered label or tag for transportation priority 1 shipments and a blue-bordered label or tag for priority 2 shipments. Shipments to be moved under transportation priority 3 must be marked with the plain DD Form 1387 or 1387-1. Exceptions to the use of these labels and tags are bundles of lumber, loose poles, and ties. Address markings for these items must be stenciled on the side directly below the identification markings. Addresses should be composed of the following:

(1) Domestic address

(a) TCN: Transportation control number.

(b) ROD or expedited handling code (when applicable).

(c) Project code, when specified.

(d) From: Name and address of consignor (coded and in-the-clear).

(e) To: Name and address of consignee (coded and in-the-clear).

(f) Piece number and total pieces (not required on full carload and truckload shipments of like items).

(g) Weight and cube: Weight and cube of each piece.

(2) Oversea address(fig 3-12)

(a) TCN: Transportation control number.

(b) ROD or expedited handling code (when applicable).

(c) Project code, when specified.

(d) Consignor: Must be shown coded and in-the-clear.

(e) Transportation priority.

(f) POE/APOE: Port of embarkation/aerial port of embarkation. Shown coded and in-the-clear.

(g) POD/APOD: Port of debarkation/aerial port of debarkation. Shown coded and in-the-clear.

(h) Consignee: Coded and in-the-clear.

(i) Piece number: (Not required for shipments of a single commodity in standard pack containers or export shipments of wood products).

(j) Total pieces: (Not required for export shipments of wood products).

(k) Weight and cube: (Each piece). (Not required for export shipments of wood products).

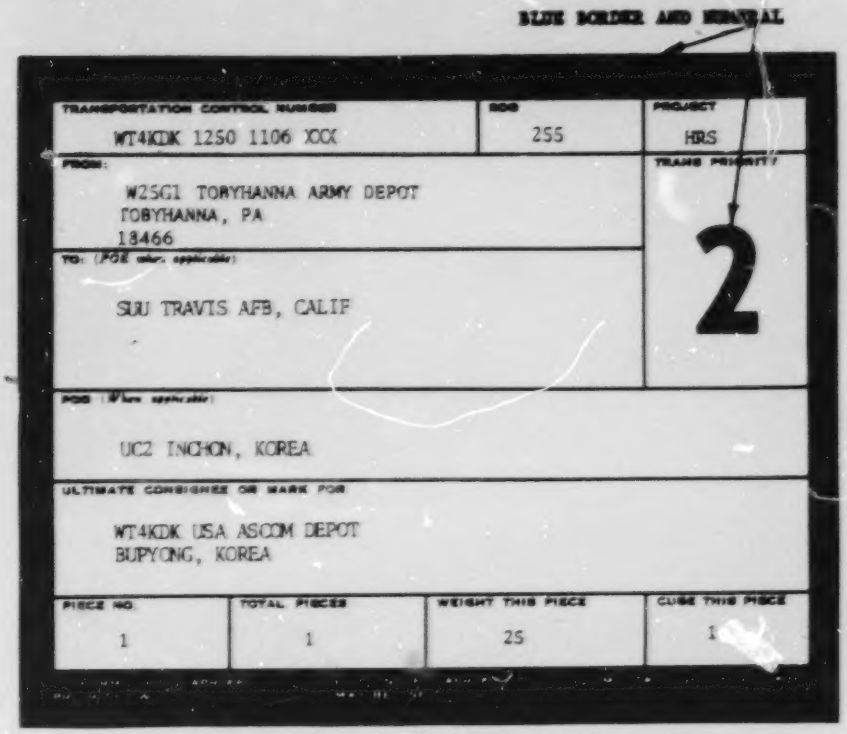

Fig 3-12. Oversea shipment label.

g. Special markings. In addition to the above required identification and address markings, some containers may require special markings. Some examples are as follows:

(1) Set or assembly marking. When a set or assembly is placed in two or more containers, all containers of component parts must be shipped together. Each container should bear, in addition to its own number within the set, the total number of containers making up the set and the number of the set in each shipment (fig 3-13). A two-inch black disc must be placed above these numbers on each container. For surfaces on which black is not legible, such as olive drab containers, the disc should be either white or yellow. All component parts of disassembled items having a serial number must have the serial number on each container of the set. When an item which does not have a serial number is disassembled for shipment, a date (month, day, year) followed by a capital letter to identify a set or assembly should be shown on the shipping containers in lieu of a serial number. Each set must bear a different letter. These markings are applied in the lower right-hand corner of the surface of the container on which the identification markings are placed.

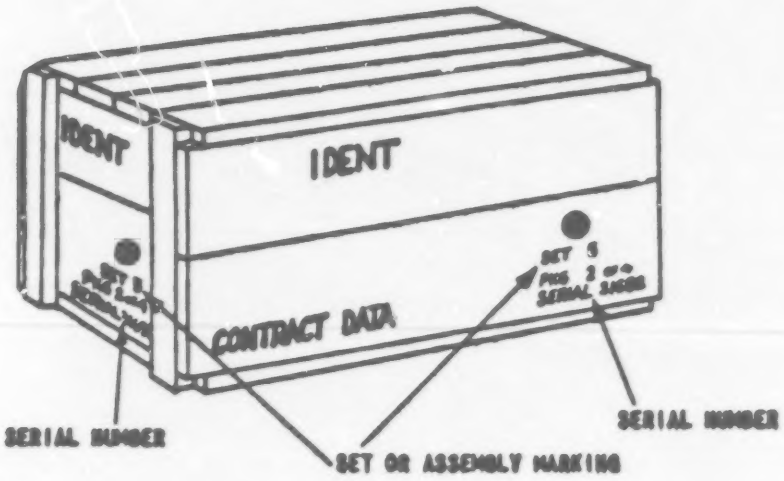

Fig 3-13. Set or assembly markings.

(2) Serial number. The serial number is the number appearing on the item as assigned by the manufacturer or Government for identification or control purposes. Serial numbers assigned by the manufacturer solely for the purpose of indicating the quantity produced should not be shown. This number is shown directly below the identification marking except when the item is a component of a set or assembly, then it is shown as illustrated in figure 3-13.

(3) Lot, control, or batch number. This is a series of numbers, letters, or both, established to record production and control of the items. When required to be shown, they are preceded by the proper designation, e.g., Lot No. 5, and are shown adjacent to the contract number.

h. Precautionary and handling markings. Many times people confuse these markings with special markings, but each has a different purpose. The special markings are used to meet certain marking requirements, while precautionary and handling markings are used when special handling instructions, markings, and warnings are required by official regulations (fig 3-14). Following is a representative listing of markings which may be required.

(1) Fragile markings. At least two surfaces of rectangular containers or two equally spaced areas on the circumference of cylindrical containers packed with delicate or fragile items should be marked "FRAGILE" by the use of labels, stencils, or imprints. These markings are placed on the upper two-thirds of containers, one on the identification marked side and the other on the end of the container. They must be conspicuous but not interfere with other required markings. Containers imprinted with "GLASS - DO NOT DROP OR THROW" or "GLASS - HANDLE WITH CARE", or similar markings do not require fragile labels.

(2) Arrows. When consideration of the safety of the contents necessitates that the containers be stacked with the top up, two sides of a rectangular container and two equi-distant points on the circumference of a cylindrical container are marked width the word "UP", with an arrow pointing toward the top of the container. The length of the arrow should not be less than one inch and the stem not less than 1/2-inch in width, proportioned to the available space. The word "UP" may be marked above the arrow head, below the stem, or on the stem.

(3) Flammable and combustible liquids. Shipping containers packed with material having a flash point of 200° F or less must be marked with the flash point of the material expressed in degrees Fahrenheit, i.e., "FLASH POINT 80° F." Size of the lettering should be not less than 1/2-inch and placed on the identification marked side of the container by means of labeling, printing, stamping, or stenciling.

(4) Method II markings. Method II packs which are shipping containers should bear a precautionary label on the identification marked side. Method II markings may be applied by means of labels, or a copy of the label may be printed or stenciled on the container using waterproof red ink. When there is insufficient space for labeling, the words "METHOD II PACKAGE, DO NOT OPEN UNTIL READY FOR USE," in letters as large as space permits must be printed or stenciled on the container.

(5) Center of balance and sling or lift points. A one-inch wide vertical line not less than three-inches long locating the center of balance should be extended up from the bottom edge of both sides of containers over 10-feet in length or those which are unbalanced. This line must be identified by stenciling or printing in one-inch letters the words "CENTER OF BALANCE" immediately above or alongside the line. On unboxed equipment, the location of designated sling or lift points should be marked in white. On vehicles which are painted white, yellow, or other light colors, the marking should be black, and the words "LIFT HERE" with arrows pointing to the lifting eyes should be placed immediately above or alongside the lifting eyes. Gasoline soluble paint must be used for marking unboxed equipment and vehicles.

(6) Magnetized materials suitable for air shipment. Packs and items containing magnetized material determined to be suitable for air shipment must be conspicuously marked on two opposite sides with a red caution label having white letters.

(7) Magnetized materials not suitable for air shipment. Packs and items containing magnetized material determined to be not suitable for air shipment must be conspicuously marked on two opposite sides with a red caution label having white lettering. Labels for magnetized materials, both suitable and not suitable for air shipment, should be 5 by 4 inches or 10 by 8 inches, depending on the size of the container.

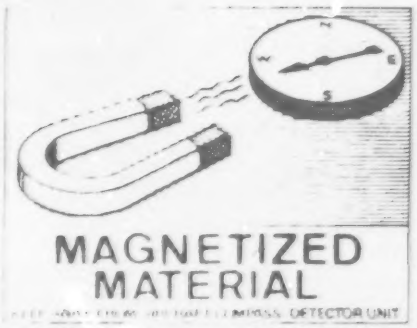

Fig 3-14. Precautionary and handling markings.

f. Location of markings. Unless otherwise stated above, markings should be located as follows:

(1) Boxes and crates. The top, bottom, and one end of all boxes must be free of markings except for special or precautionary and handling markings which may be required (fig 3-14). For boxes and crates over 10 cubic feet, the identification markings are printed or stenciled directly on the upper two-thirds of one end, which is known as the marked end. This marking is not required for boxes or crates under 10 cubic feet. On the side of the container to the right of the marked end, the identification markings are printed or stenciled on the left, upper two-thirds of the container. Contract data is printed or stenciled directly below the identification marking. An alternate method for marking unsheathed crates is by utilizing marking boards constructed of 1/4-inch plywood. These boards are located on the upper two-thirds of one side and one end of the crate (end marked only on crates over 10 cubic feet in size). Set or assembly markings are placed in the lower right-hand corner of the surface(s) containing the identification markings. With the exception of center of balance and sling lift point markings, any other special markings required should be placed on the right, upper two-thirds of the container in such a way that they do not interfere with other markings. The address label or tag is applied to the lower two-thirds of the marked side. In the event a container is too small to accommodate the address label on the marked side, it should be applied on the opposite side of the container.

(2) Barrels and drums. The identification markings on barrels and drums is stenciled or printed on the upper one-third of one side and on the top. The contract data should be shown on the upper one-third of the side diametrically opposite the identification markings. On barrels or drums equipped with rolling rings, the address label is placed in the middle one-third on the side containing the identification markings. When not equipped with rolling rings, the address label is placed not less than six-inches above the bulge of the barrel to avoid rubbing off or blurring the label.

(3) Bales and cloth covered bundles. Identification markings are stenciled on the upper two-thirds and as close to the left as possible of the side of the bale or bundle having the largest marking area. Contract data should be placed on the upper right-hand corner of the marked side. The address label is applied to the lower two-thirds of the marked side.

3-12. STORAGE QUALITY CONTROL PROGRAM

a. Introduction. The employment of all the proper techniques of packaging and storage described in this text and the referenced official directives are for naught, if after the supplies are placed in a storage area, they are left unattended. The Storage Quality Control Program conducted at the Marine Corps Logistics Bases and Fleet Marine Force (FMF) activities which have custody of mount-out stocks to support mobilization is organized to prevent deterioration. Detailed policies and guidelines of the program are found in Chapter 4 of the current edition of MCO P4400.75, Chapter 5 of MCO P4030.36, and in the current edition of DOD 4145.19-R-1. The objective of the Storage Quality Control Program is to ensure that all items in storage are maintained in a serviceable, ready-for-issue condition.

b. Scope. This program consists of, but is not limited to, cyclic, scheduled, and special inspections, conducted to:

(1) Properly identify the item.

(2) Determine the condition of the item.

(3) Correct observed deficiencies on location to the greatest extent possible. This may include:

(a) Container repairs.

(b) Resealing of unit and exterior packs.

(c) Correction of incomplete markings.

(d) Correction of improper markings.

(e) Replacing broken or loose banding.

(f) Accomplishing minor mechanical repairs.

(4) Determine completeness of the item.

(5) Detect mildew, spoilage, insect infestation, rodent, or other pest damage to stocks, prescribe or administer treatment, and ensure that corrective measures are taken.

c. Types of inspections. There are three types of inspections associated with the Storage Quality Control Program. These inspections are visual, spot, and full.

(1) Visual inspections. Observing the item and its container to determine whether damage has occurred or if repairs are needed. This type of inspection does not normally require disassembly or performance testing of the inspected item.

(2) Spot inspection. Ordinarily the inspection of a representative sample of the total quantity of an item to give a reasonably accurate estimate of the condition or degree of serviceability of the whole lot.

(3) Full inspection. A 100% inspection of the entire quantity of an item. A full inspection is performed when a spot inspection indicates that stocks of the item inspected are not in a ready-for-issue condition.

4. Control measures. Some of the control measures that may be employed in conducting an effective Storage Quality Control Program are as follows:

(1) Sanitation. This is one of the most important of these control measures because insects and rodents thrive in filth. An aggressive program of "cleanup" after operations and the maintenance of high standards of good housekeeping methods assist in the control of insects and rodents, but they also reflect the efficiency of the whole storage operation.

(2) Control of temperature. The proper control of temperature is another measure that can be used to retard insects. Temperatures of 40^{0} to 50^{0} F will retard most insect activities, and a temperature of 30^{0} F will kill most insects. However, there are a few insects that thrive at temperatures as low as 0^{0} F.

(3) Sprays. There are three types of sprays that are effective against insects: residual, contact, and aerosol.

(a) Residual insecticide sprays (those that leave an effective residue) should be used to provide long-lasting protection to noninfested stocks or to prevent the spread from previously infested materials.

(b) Contact sprays (those that kill on direct contact only) should be used when a comparatively nontoxic material is desired, for general cleanup purposes, and for the control of certain types of flying insects (moth, files, etc).

(c) Aerosol sprays are liquids suspended in a gas. This type of spray is generally used to supplement the residual spray.

(4) Fumigation. Fumigation will normally produce a satisfactory insect kill when the temperature is 60^{0} F and higher. Use of a vacuum chamber is an effective and efficient method of fumigating stocks. As there is no residue generated to provide continued protection, fumigated stocks should be stored in an area that has been sprayed previously with a residual insecticide.

(5) Rat control. Observation of rat signs, such as droppings, runways, tracks, burrows, nests, damage to stored supplies, etc, is essential in determining whether rats currently infest buildings. The primary factors influencing the degree of infestation are the amounts of food and shelter available; therefore, the cleanliness of an establishment is a most important factor affecting the number of rats which may be present. To be effective and successful, any rat control program should be thorough and done on a continuous basis. The control program should include removal of food and water supply, eliminating shelters, ratproofing structures and eradication by trapping, poisoning, and burrow fumigation. Ratproofing is accomplished thorough the use of mesh wire or sheet metal to cover all openings larger than 1/4-inch around windows, pipes, doors, and wire conduits. There are several poison baits which may be used to eliminate rats, but because most are toxic to humans and domestic animals, they should be used by trained and experienced personnel only. Traps are recommended for use in those areas where poison bait or gas cannot be used. Baits may be any food attractive to rats, and they should be varied every few days.

BASIC WAREHOUSING

Lesson 3

Preservation and Packing Procedures

STUDY ASSIGNMENT: MCI 30.1k, Basic Warehousing, chap 3.

LESSON OBJECTIVE: To teach you the fundamentals of preserving and packing military supplies for shipment and storage.

WRITTEN ASSIGNMENT:

A. Multiple Choice: Select the ONE answer which BEST completes the statement or answers the question. After the corresponding item number on the answer sheet, blacken the appropriate circle.

Value: 1 point each

1. What is the subject of Department of Defense Instruction 4100.14?

   a. Request to congress to legislate on preservation policies
   b. Packaging of material
   c. Implementation of the department preservation policies
   d. Historical development of the levels of preservation

2. Which Marine Corps order issues the policy on preservation, packing, and marking of military items?

   a. MCO P4030.36
   b. MCO P4030.19
   c. MCO 4030.25
   d. MCO P4030.2T

3. Which preservation operation should immediately follow the cleaning operation?

   a. Application of a preservative
   b. Wrapping
   c. Packing
   d. Drying

4. Preservation operations should follow one another as close as possible to

   a. prevent recontamination of the item.
   b. prevent loss of item identification.
   c. protect the preservation coating of the item.
   d. prevent the item's preservation from soiling.

5. Which Marine Corps order lists detailed instructions for accomplishing preservation operations?

   a. MCO P4030.31
   b. MCO P4235.17
   c. MCO P4500.16
   d. MCO P4600.9

6. What level of preservation and packing is applied to items to protect them against the most severe conditions known or anticipated during handling?

   a. Level A
   b. Level B
   c. Industrial Packing

7. What level of preservation and packing is needed if items are exposed to all extremes of environment during shipment?

   a. Level A
   b. Level B
   c. Industrial packing

8. Before preserving items to conform to Level B, you should know the type of

   a. storage facilities at the destination.
   b. unfavorable climate at the destination.
   c. load to be formed.
   d. shipping containers to be used.

9. The first wrap or container applied to an item is the

a. interior container.
b. intermediate pack.
c. shipping container.
d. unit pack.

10. A pack which contains two or more identical unit packs is a(an)

a. unit pack.
b. shipping container.
c. intermediate pack.
d. combination wrap.

11. Which Marine Corps order gives the application methods for unit protection?

a. MCO P4030.31
b. MCO 4030.17
c. MCO P4030.14
d. MCO 4030.12

12. Each unit pack must protect the item until it is

a. released by the manufacturer.
b. opened at its final destination.
c. opened for inspection.
d. received from the carrier.

13. In selecting the method of unit protection, how many factors must be considered?

a. 2
b. 4
c. 6
d. 8

14. Which operation includes placing an item into its shipping container?

a. Unit protection
b. Cleaning
c. Marking
d. Packing

15. What level of packing may be used for supplies shipped for immediate use?

a. Level A
b. Level B
c. Industrial packing

16. What type of load must fit snugly into a box, giving support to all surfaces?

a. Type 1
b. Type 2
c. Type 3

17. Which type of load gives little or no support to the shipping container?

a. Type 1
b. Type 2
c. Type 3

18. When your choice of exterior containers is between two that give the same protection to an item, you should choose the one that

a. has the lowest original cost.
b. stacks and handles the easiest.
c. will keep tare weight and cube to a minimum.
d. is most acceptable to a unit load.

19. What is tare weight?

a. Weight of the container
b. Weight of the contents of a container
c. Weight of the contents plus the container
d. Gross weight minus the weight of the container

20. The weight of packages mailed air parcel post is limited to _____ pounds.

a. 40
b. 60
c. 70
d. 100

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21. The maximum size (length and girth combined) of packages mailed at, or to, a first class post office in the United States is _____ inches.

a. 55
b. 64
c. 84
d. 72

22. The basic publication for marking military supplies is

a. MIL-STD-129.
b. MIL-P-116.
c. MIL-STD-290.
d. MIL-STD-212.

23. To ensure movement of supplies without confusion or delay, they must be properly

a. packed.
b. preserved.
c. marked.
d. unitized.

24. What material is used to mark unboxed or uncrated equipment such as vehicles?

a. Stencil enamel
b. Gasoline soluble paint
c. Stencil lacquer
d. Water emulsion paint

25. On a shipping container, the size of address markings on paper labels should be

a. 1/4" to 3".
b. 3/4" to 1".
c. 7/16" to 3".
d. 10-point type.

26. When no National Stock Number (NSN) is available in identification marking, what will be used to identify the container(s), palletized loads, or unpacked items?

a. Project code (PC)
b. Reporting unit code (RUC)
c. Federal supply classification code (FSC)
d. Transportation control number (TCN)

27. Gross weight is the combined weight of the

a. contents, dunnage, and container.
b. contents and dunnage.
c. net weight and cube.
d. cube, contents, and container.

28. Which is the correct way of marking a container of ten and seven-tenths cubic feet?

a. 10.7
b. 10-7
c. 10.07
d. 10/7

29. The purpose of a packing list is to

a. record the number of containers in a shipment.
b. furnish a description of items in a container.
c. help form a loading pattern for the shipment.
d. provide due-in information to the receiving activity.

30. You are required to mark a box FRAGILE. On how many surfaces of this box should you place the label?

a. 4
b. 3
c. 2
d. 1

31. Identification markings may be omitted form the marked end of a box when

a. there is room only for the address.
b. special markings must be applied to the container.
c. the size of the container is less than 10-cubic feet.
d. the contract date is used.

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32. The serial number is considered what type of marking?

a. Precautionary
b. Location
c. Special
d. Handling

33. On a barrel that has rolling rings, what marking is placed in the middle one-third section?

a. Item name
b. Contract data
c. Address
d. Special markings

34. Shipping containers containing flammable items must be marked with the flash point when it is

a. 300° F or less.
b. 250° F or less.
c. 225° F or less.
d. 200° F or less.

35. A military shipment label having a blue border is used for what transportation priority?

a. 2
b. 3
c. 4
d. 5

36. Where should identification markings be placed on barrels and drums?

a. Lower 1/3 of two sides
b. Upper 1/3 of two sides
c. Upper 1/3 of one side and the top
d. Lower 1/3 of one side and the top

37. The storage quality control program is conducted to

a. collect data.
b. support FMF troops.
c. prevent deterioration.
d. store material.

38. The objective of the storage quality control program is to

a. properly identify the items in stock.
b. determine completeness of an item.
c. control temperatures of warehouses.
d. make certain supplies are serviceable and ready-for-issue.

39. Which type of inspection does not require the disassembly of the inspected item?

a. Technical
b. Visual
c. Spot
d. Full

40. The most important control measure you can use in conducting an effective storage quality control program is to

a. control warehouse temperature.
b. make sure doors and windows are locked.
c. use sprays often.
d. use good sanitation methods.

41. Insecticide sprays used to provide long-lasting protection are called _____ sprays.

a. residual
b. contact
c. aerosol

42. Poison baits used td eliminate rats should be used only by

a. a medical officer.
b. trained personnel.
c. a chemical engineer.
d. a registered pharmacist.

Total Points: 42

* * *

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Chapter 4

FIELD WAREHOUSING AND STORAGE OPERATIONS

Section I. FIELD WAREHOUSING OPERATIONS

4-1. INTRODUCTION

a. The Fleet Marine Force is a force in readiness. To ensure material readiness, supplies must be packaged, packed, marked, and located to permit deployment with a minimum of time and effort. All elements of the FMF are required to maintain organic mount-out stocks in a state of readiness for deployment on short notice. Field warehousing procedures have been standardized so that all elements of the FMF will package, pack, and mark their mount-out support stocks in a like manner. This chapter presents the principles and procedures for packing and marking a unit's organic mount-out stocks, and for setting up a field supply point when deployed.

b. To better understand field warehousing operations, you should know the following terms and their definitions:

(1) Organic mount-out stocks. Supplies and equipment within any given FMF organization at the time of embarkation.

(2) Mount-out block. A quantity of supplies assembled by a supply unit embarking in support of another FMF unit.

(3) Mount-out block designator. An alphabetic designator assigned each mount-out block for identification, location, and control purposes.

(4) Tactical markings. Markings assigned by FMF commanders to be placed on a unit's organic supplies and equipment for control and ownership identification.

(5) Storage categories. Supplies in a field warehousing mount-out block are divided into storage categories for location and control purposes, based on physical characteristics, stock levels, and popularity of issue. The three storage categories are: bin storage, medium storage, and bulk storage (explained in paragraph 4-2).

(6) Bin storage units

(a) A field warehousing bin storage unit consists of a wooden box with metal-edged fiberboard inserts (boxes).

(b) A field warehousing standard bun storage unit consists of six wooden boxes arranged on a standard 32- x 40-inch pallet in a manner that permits entry from two sides. Supplies are contained in metal-edged fiberboard inserts (boxes) placed in the wooden boxes.

(c) A field warehousing box pallet bin unit consists of a 32- x 40- x 32 1/4-inch box pallet, mounted on a standard 32- x 40-inch pallet, constructed to permit entry from two sides. The standard metal-edged fiberboard inserts (boxes), containing the supplies, are stored in the box pallet.

4-2. STORAGE CATEGORIES

For the purpose of field warehousing, the storage of supplies is divided into three categories: bin, medium, and bulk.

a. Bin storage. A bin storage section is designed primarily to accommodate small, rapid moving items, such as repair parts, handtools, and common hardware. A bin storage unit consists of a wooden box with metal-edged fiberboard inserts. Six wooden boxes are arranged on a standard 32- x 40-inch pallet, back to back, to permit entry from two sides (fig 4-1). If materials handling equipment is available, the wooden boxes may be secured to the pallet with steel strapping and moved as a unit; if not, the boxes are moved individually by hand. If the unit has organic materials handling equipment, a 32- x 40-inch box pallet may be substituted for the six boxes (fig 4-2). The box pallet must permit entry from two sides. Items are stored in metal-edged fiberboard inserts.

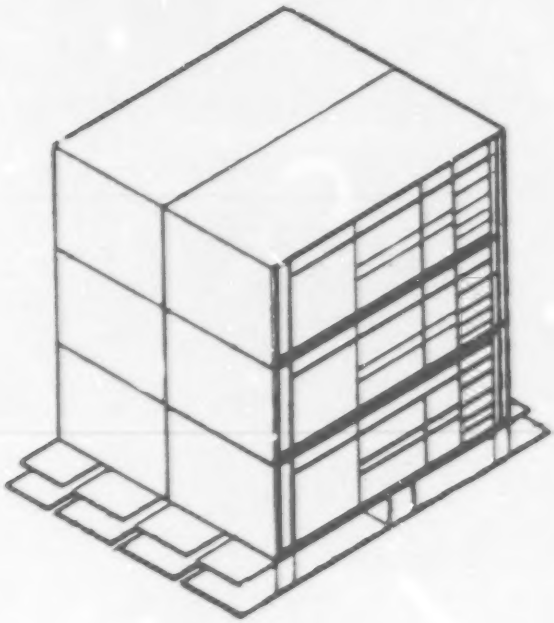


Fig 4-1. BIN storage-standard pallet.

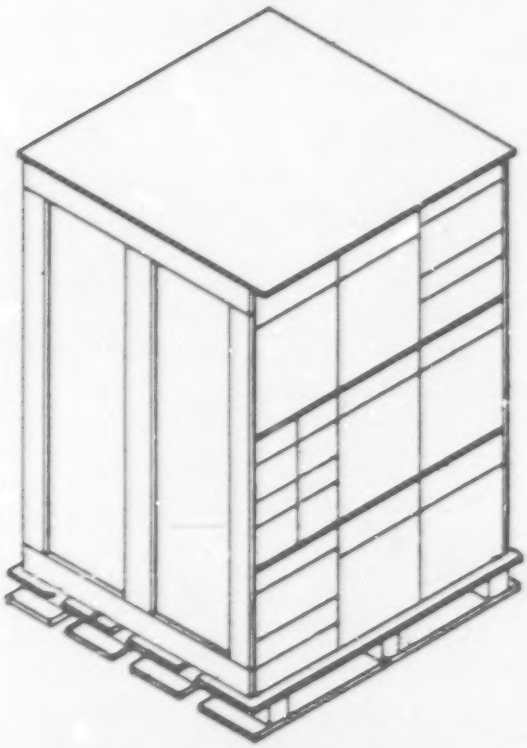


Fig 4-2. Bin Storage-box pallet.

b. Medium storage. A medium storage section (fig 4-3) is designed to contain items that are too large to occupy metal-edged fiberboard inserts in bin storage, but not large enough for individual boxes or crates. A medium storage section will contain such items as medium-sized repair parts and assemblies. A medium storage unit consists of a box pallet manufactured on a standard 32- x 40-inch pallet or a standard bin storage unit, less the metal-edged fiberboard inserts. Items placed in medium storage must be given the required unit protection explained in paragraph 3-3.

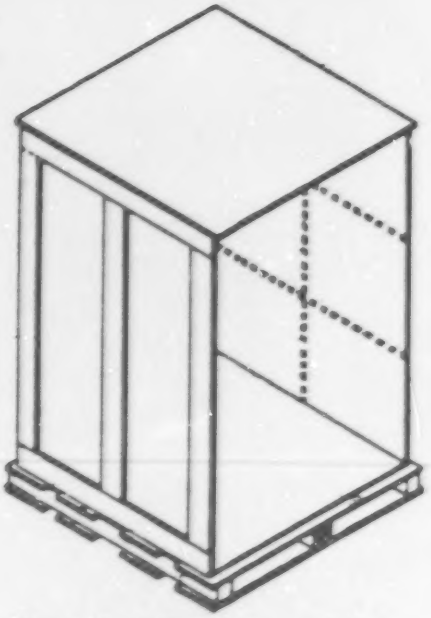


Fig 4-3. Medium storage section.

c. Bulk storage. A bulk storage section consists of large, heavy items, such as truck engines, gun tubes, and transmissions, or items received, stored, and issued in large quantities (clothing). Large bulky items will be packed in individual crates or metal shipping containers (fig 4-4). Each crate must be skid-mounted to permit mechanized handling. Items that are received and stored in large quantities must be packed in boxes manufactured in accordance with MCO P4030.21. These items may be palletized into unit loads on the standard 40- x 48-inch pallet when materials handling equipment is available.

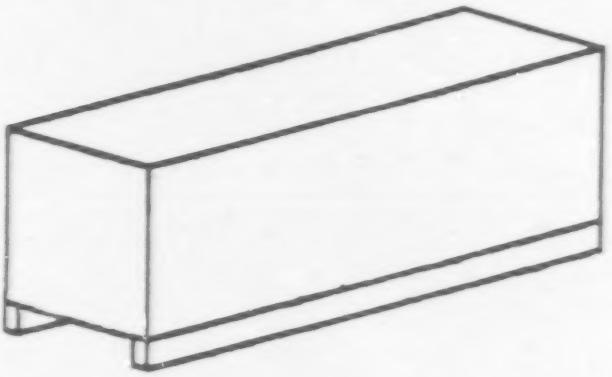


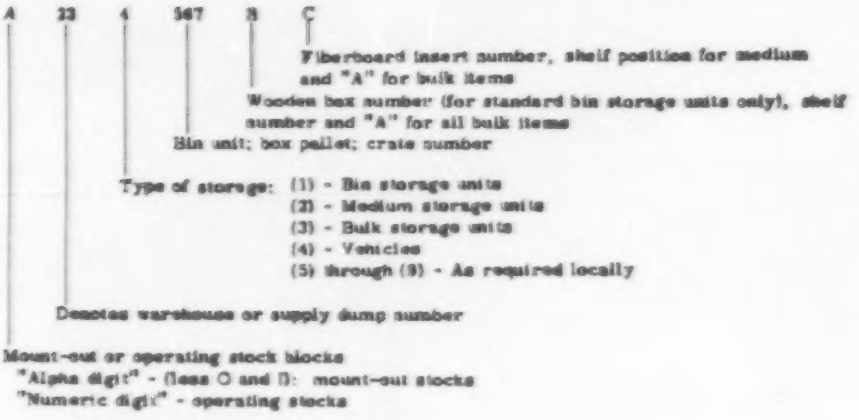
Fig 4-4. Bulk storage section.

4-2. STOCK LOCATION

A good stock locator system is essential to the effective warehousing of supplies. Stock location records must permit rapid location of supplies while a unit is in garrison or when it is deployed under field conditions.

a. Locator file. The locator file must be maintained in stock number sequence. The locator card NAVMC 10849 (fig 4-5) is to be utilized. The location card must contain at least the stock number, unit of issue, location number, and the item name (when space is available).

b. Stock location number. The basic stock location number consists of nine (9) alpha/numeric digits broken down as outlined below. The last two digits of all bulk items will be AA.


A 33 4 567 B C
Fiberboard insert number, shelf position for medium and "A" for bulk items
Wooden box number (for standard bin storage units only), shelf number and "A" for all bulk items
Bin unit; box pallet; crate number
Type of storage: (1) - Bin storage units
(2) - Medium storage units
(3) - Bulk storage units
(4) - Vehicles
(5) through (9) - As required locally
Denotes warehouse or supply dump number
Mount-out or operating stock blocks
"Alpha digit" - (less O and I): mount-out stocks
"Numeric digit" - operating stocks

c. Stock location records. Flexibility is a requirement in maintaining stock location records of manual and mechanized supply support units within the FMF. Therefore, three methods are explained here. The local commander selects the method best suited to meet the requirements of his unit. Regardless of the manner in which records are maintained, the use of the standard field warehousing stock locator number and standard field warehousing box markings is mandatory for field warehousing containers.

(1) Manual. When a manual stock locator file is used, all work, including original preparation, is performed by hand. Identification and location information is maintained on a file card, NAVMC 10849-SD (fig 4-6) or a local form. The cards are filed in stock number sequence in suitable boxes or cabinets. This type of file provides all location data necessary, but does not provide for the mechanical preparation of inventory listings or matching with the balance cards. This type of locator file is used primarily when a small number of stock items are carried, particularly when the items are slow-moving. The cost of installing this locator file is relatively small because no additional equipment and no support from outside sources is required. However, when the volume of transactions is great, the cost of maintenance increase because of the number of man-hours required to keep it current. Furthermore, the larger number of manual entries and postings increases the chances of human error.

(2) Manual-mechanical. A manual-mechanical locator file is one on which part of the work is performed manually and part mechanically by electric accounting machine (EAM) cards (fig 4-5). This file may be set up in tubs equipped with sliding tables which locator clerks use as desk space. Besides the tubs and cards, no additional equipment is necessary to maintain the locator file. Stock location cards are prepared mechanically from other machine accounting cards at a small cost. The basic information (stock number and unit of issue) is inserted in the card mechanically. Stock location data is handwritten on the cards. This type of location file provides all location data necessary, plus the capability of mechanically reproducing inventory tickets and listings. Generally, the manual-mechanical system is used at the large supply support installations which have EAM's for stock recordkeeping. This locator system costs relatively little to install and maintain, and requires a minimum of equipment.

(3) Mechanical. When a mechanical stock location file is used, all of the work is accomplished mechanically.

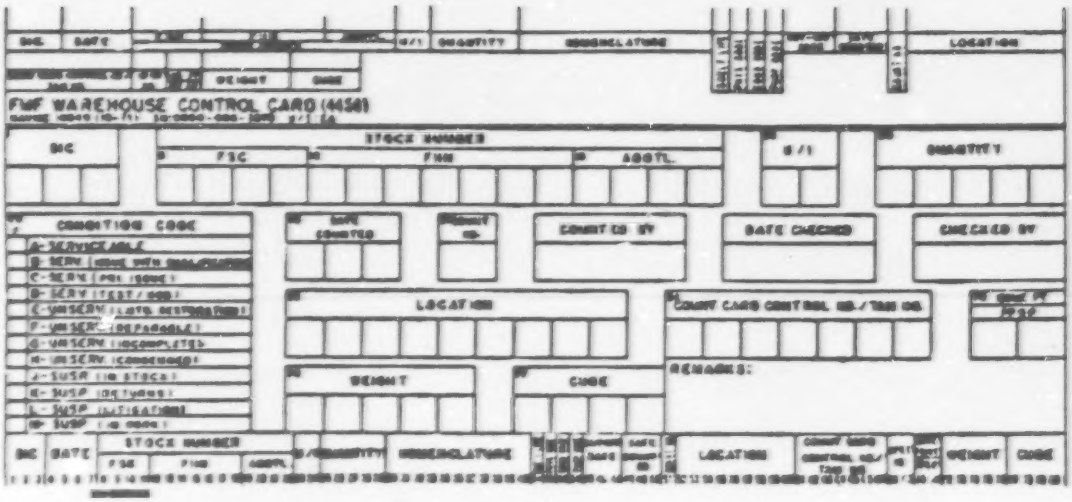


Fig 4-5. FMF Warehouse Control Card (NAVMC 10849).

4-4. FIELD WAREHOUSING CONTAINERS

The following containers are authorized for use in the field warehousing system:

a. Bin units

NSN	DESCRIPTION
3990-00-542-3294	PALLET, wooden, 4-way entry, 32 x 40-inches
8115-00-685-5171	BOX, wooden, knocked-down
8115-00-753-5033	BOX, fiberboard, metal-edged, 14 1/4 x 12 x 9 3/4-inches
8115-00-753-5034	BOX, fiberboard, metal-edged, 14 1/4 x 12 x 4 7/8-inches
8115-00-753-5035	BOX, fiberboard, metal-edged, 14 1/4 x 6 x 4 7/8-inches
8115-00-753-5036	BOX, fiberboard, metal-edged, 14 1/4 x 6 x 3 1/4-inches

(1) Units which have organic materials handling equipment may substitute the box pallet for the wooden boxes that comprise the standard bin storage units. The box pallet is compatible with the family of metal-edged inserts which are standard in the wooden box unit (fig 4-6 and fig 4-7).

(2) The metal-edged inserts are supplied in bundles of "box flats." A metal-edge-stayer machine is required to assemble the boxes and lids. These metal-edged inserts and lids are assembled by service units, force service regiments, and Marine wing service groups.

b. Medium storage units. The basic medium storage unit may be composed of a box pallet (fig 4-8) or a standard bin storage unit, less the metal-edged fiberboard inserts.

c. Bulk storage units. The following containers are used in bulk storage (fig 4-9): (1) reusable shipping and storage containers, such as engine and transmission containers, and (2) wooden crates and boxes made in accordance with MCO P4030.21. The storage units are assembled while the organic unit is in garrison. The local base material battalion has a

preservation and packing section which builds crates and wooden boxes and performs required preservation and packing. This service should be used by FMF units. A work order is submitted through prescribed channels to have boxes made and preservation and packaging accomplished for your unit. If this service is not available, you should check MIL-P-116 or MCO P4030.31 for preservation methods which can be used by units in the field which have small amounts of material and equipment.

4-5. MARKING OF CONTAINERS

The standard marking of field warehousing containers is necessary to the rapid and orderly assembly and sequencing of stocks in storage areas, and provides identification for the contents of the containers. These location markings are required, and additional markings may be assigned locally.

a. Tactical markings. Tactical markings are assigned by FMF commanders. The location markings in this paragraph are in addition to any tactical markings required by the FMF.

b. Markings of bin units. Since there are two types of field warehousing bin units authorized (the box pallet and the six wooden boxes secured to a 32- x 40-inch pallet), two methods of location markings are required.

(1) Box pallet bin unit. When used as a bin unit, the box pallet must be marked with the mount-out block designator, the supply dump or building number, type storage unit designator, and the storage unit number (fig 4-7).

(2) Field warehousing standard bin storage unit. The standard bin storage unit mounted on a 32- x 40-inch pallet must be marked on the ends with the mount-out block designator, the supply dump or building number, type storage, unit designator, bin unit number, and the box number (fig 4-6).

c. Marking of metal-edged inserts. When these inserts are used with the box pallet, they should be marked as shown in figure 4-7; when used as inserts in the standard bin storage unit, mark them as shown in figure 4-6.

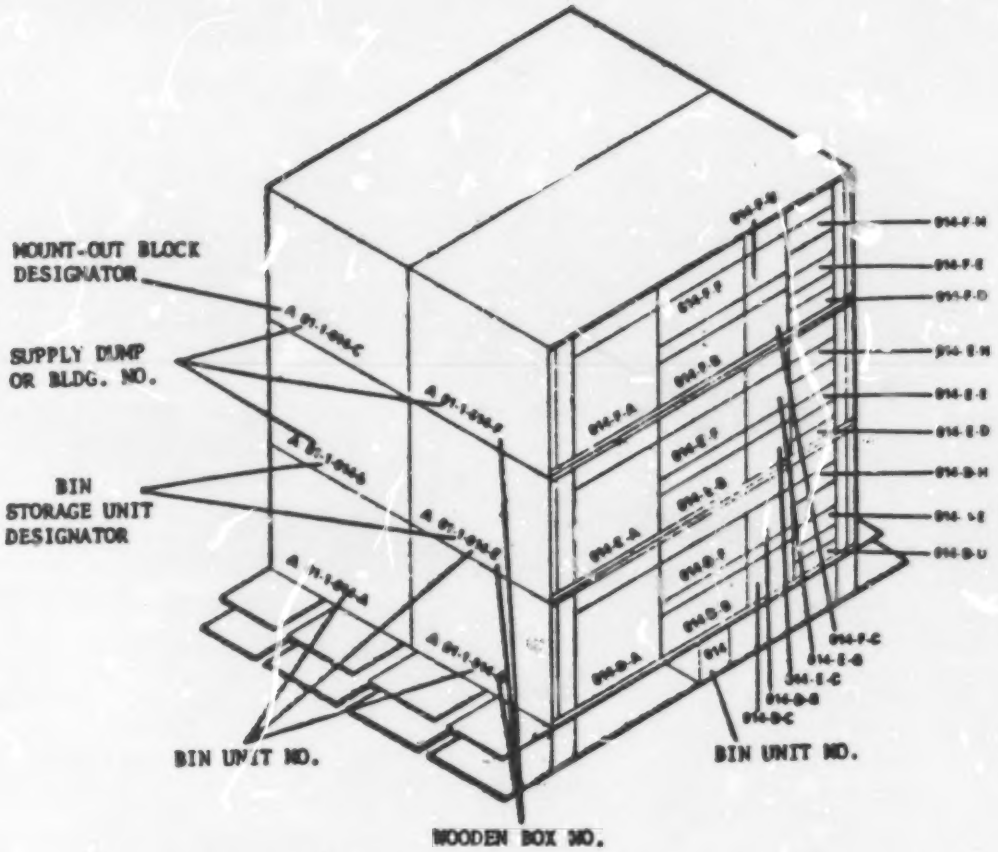


Fig 4-6. Location markings for standard bin storage unit.

Marking of Wooden Boxes

Marking	Definition
A	Mount-out block designator. (Will be assigned as required.)
01	Supply dump or warehouse No. When a unit is in garrison, local control numbers may be assigned to those warehouses that have more than one number in their designation. For example: warehouse number 1108 may be assigned local control No. 01, warehouse 1117 may be assigned No. 02, etc. These local control numbers are used as supply dump number when unit is deployed.
1	Type of storage (bin storage unit)
014	Bin unit No. Pallets are arranged in numerical sequence within the storage area.
A-F	Wooden box No. Read from left to right and bottom to top (six boxes to the pallet).

Marking of the Metal-edged Inserts

Marking	Definition
014	Bin unit No. Required to identify the insert with the correct bin unit.
A-F	Wooden box No. (marked A through F). Required to identify the insert with the correct wooden box.
A	Insert No. The number shown on the diagram following the wooden box number is the insert number. Read from left to right, bottom to top.

Specifications

Wooden box. Location markings to be block lettering: size - 1 inch high; color - black.

Metal-edged inserts. Location markings to be block lettering: size - 1/2 inch high; color - yellow or white.

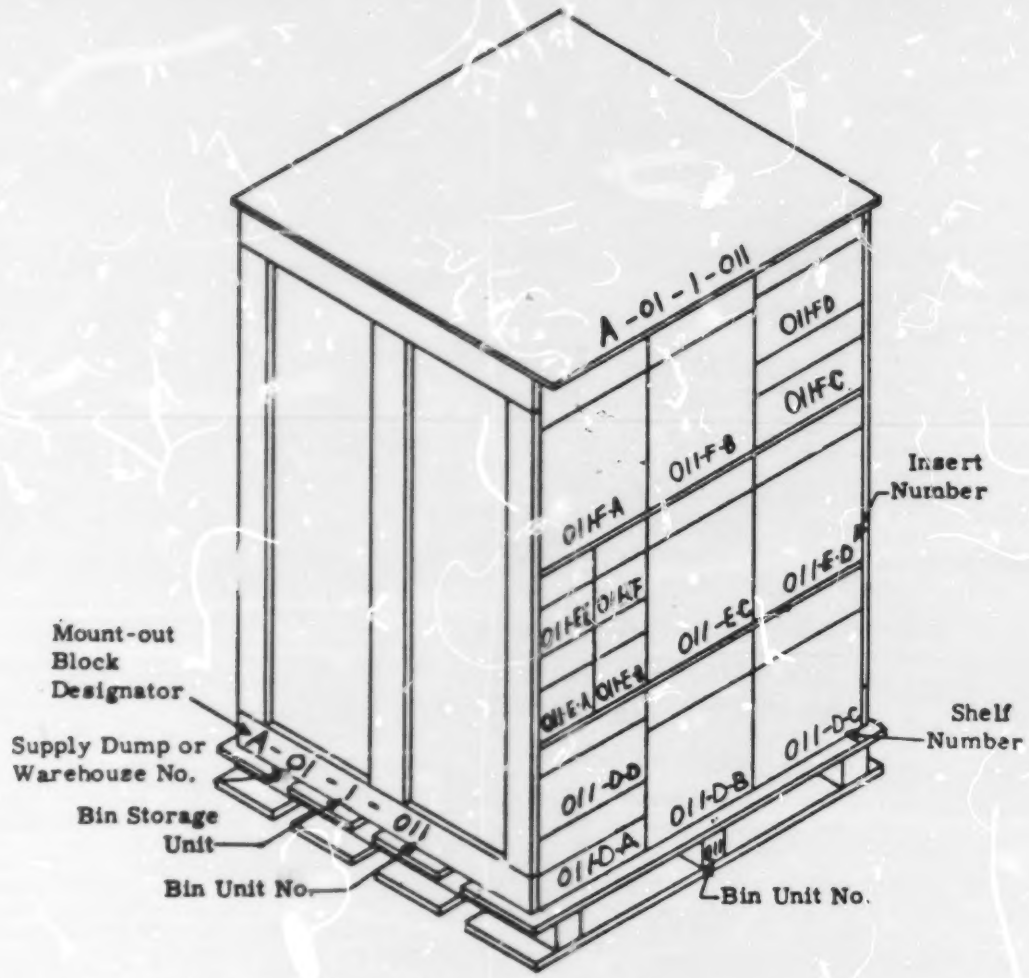


Fig 4-7. Location markings for box pallet bin unit.

Marking of Box Pallet

Marking	Definition
A	Mount-out block designator. (Will be assigned as required).
01	Supply dump or warehouse NO. When a unit is in garrison, local control numbers may be assigned to those warehouses that have more than one number in their designation. For example: warehouse number 1108 may be assigned local control No. 01, warehouse 1117 may be assigned No. 02, etc. These numbers are used as supply dump numbers when unit is deployed.
1	Type of storage (bin storage unit).
011	Bin unit number. Bin units are always arranged in numerical sequence.

Marking of the Metal-edged Inserts

Marking	Definition
011	Bin unit No. Required to identify the insert with the correct bin unit.
D-F	Shelf number. Required to identify shelf position of insert.
A-F	Insert number. Read from left to right, by shelf.

Specifications

Bin storage unit. Location markings to be block lettering: size-3 inches high; color-black

Metal-edged inserts. Location markings to be block lettering: size-1/2 inch.

d. Marking of box pallets for medium storage. Box pallets that contain medium storage items will be marked with a mount-out block designator, supply dump or building number, medium storage designator, and the unit number (Fig 4-8).

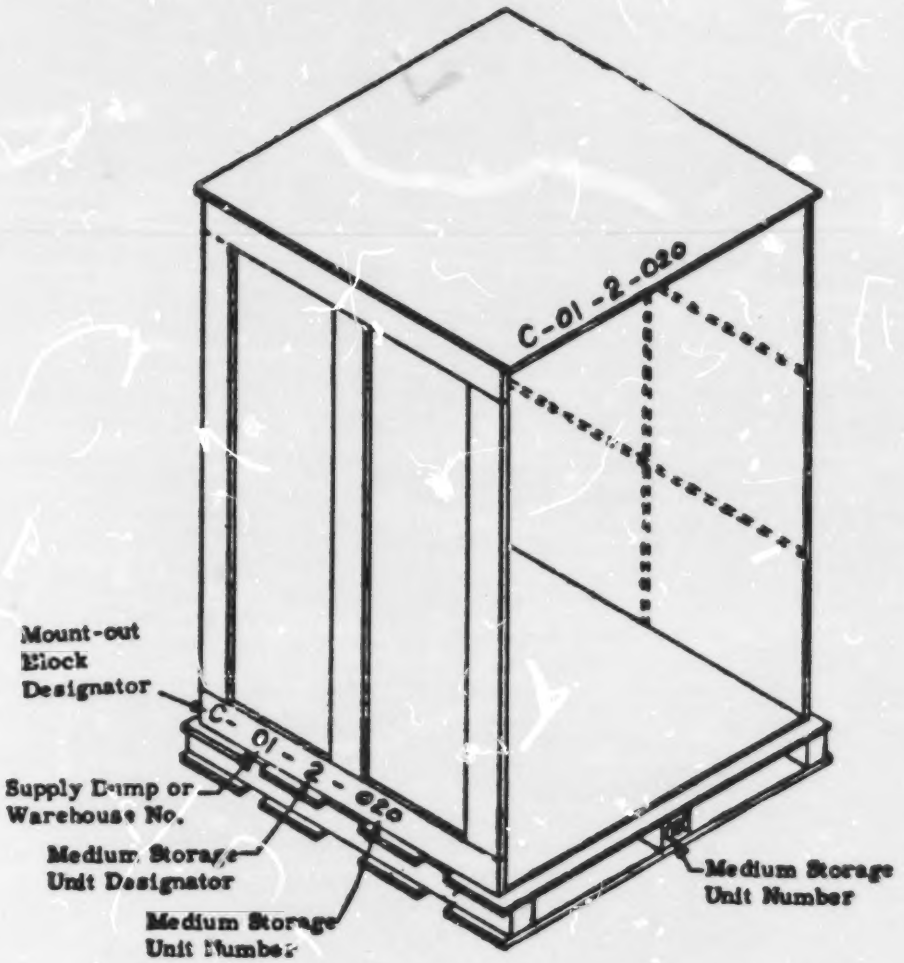


Fig 4-8. Location markings for medium storage box pallet.

Side and Top Markings of the Box Pallet

Markings	Definition
C	Mount-out block designator. (Will be assigned as required.)
01	Supply dump or warehouse number. When the unit is in garrison, local control numbers may be assigned to those warehouses that have more than one number in their designation. For example: warehouse number 1108 may be assigned local control No. 01, warehouse 1117 may be assigned No. 02, etc. These numbers are used as supply dump numbers when unit is deployed.
2	Medium storage unit designator. Required to identify medium-lot storage because the outside appearance of the container is the same as a box pallet used as a bin storage unit.

020 Medium storage unit number. Containers are arranged in numerical sequence within the storage area.

AA Medium Storage Shelf Number: Use when shelves are utilized. (See para 4-3b.)

Specifications

Location markings to be block lettering: size - 3 inches high; color - black.

e. Marking of bulk storage containers. The most common types of containers in the bulk storage section are: (1) manufactured crates for large, heavy items, such as spare gun tubes, transmissions, and final-drive assemblies; (2) reusable metal containers for items such as tanks, LVT's, and aircraft engines; and (3) overseas shipping containers for bulky items shipped in large lots (such as clothing). Crates and reusable containers must be marked with a mount-out block designator, supply dump number, bulk storage designator, and unit number (fig 4-9).

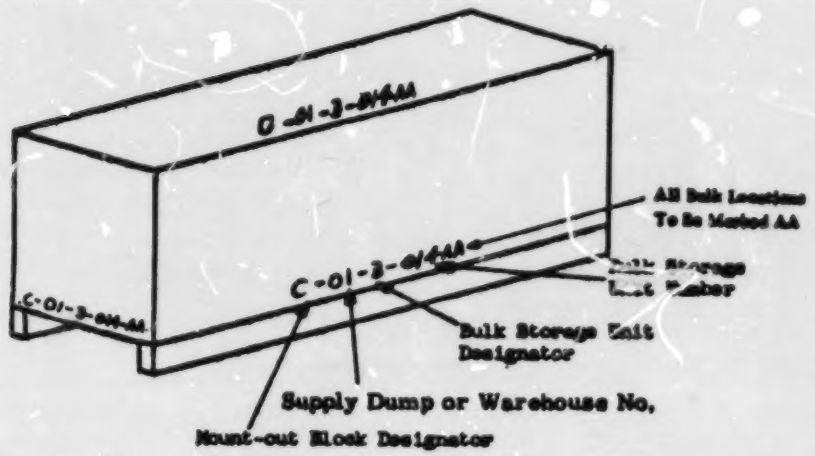


Fig 4-9. Location markings for crates or reusable containers (bulk storage units).

Side, Top, and End Markings for the Container

Marking	Definition
C	Mount-out block designator. (Will be assigned as required.)
01	Supply dump or warehouse number. When the unit is in garrison, local control numbers may be assigned to those warehouses that have more than one number in their designation. For example: warehouse number 1108 may be assigned local control No. 01, warehouse 1117 may be assigned No. 02, etc. These numbers are used as supply dump numbers when unit is deployed.
3	Bulk storage unit designator. Identifies the item as requiring storage in the bulk storage section.
014	Bulk storage unit number. Crates and containers to be arranged in numerical sequence.
AA	Bulk Storage Unit. All bulk storage units to be marked AA.

Specifications

Location markings to be block lettering: size - 3 inches high; color - black.

4-6. DEPLOYMENT

You should have everything accomplished in garrison before a warning or deployment order is received. Every item to be placed on location in bin or medium storage should be (1) inspected for serviceability, (2) properly packed and preserved, (3) marked for identification, and (4) placed in the field warehousing containers. Bulk units should be preserved, packed, and marked. Obsolete, unserviceable, or excess items should NOT be on location in the mount-out containers. The mount-out containers should be on hand, packed, marked, and (except for box lids to be fastened and steel strapping to be applied) ready to go to the field at all times.

a. Before deployment. In garrison, constant access to the contents of containers is required to permit in-stock maintenance, stock rotation, and inventory. Bin and medium storage units may be stacked, two high, in rows arranged in numerical sequence. Lids for the containers may be stored between or on the top of units. Tools used in securing the lids to containers must be available at all times.

b. During deployment. When a warning order is received, mount-out supplies must be inspected for completeness, tactical markings, and accuracy of location records. There should be no deficiencies; if deficiencies are noted, they must be corrected within the time allotted (if possible). The shipment of supplies in field warehouse containers may involve overland, sea, or air transportation. Containers must be packed to provide maximum protection for the supplies when they are loaded into, transported by, or unloaded from, all types of transportation where materials handling equipment (such as cranes, slings, forklift trucks) and manhandling may be used. This may require interior blocking and bracing within the storage units. When the mount-out supplies are received in the area of operations, the sequence of moving stocks into the designated storage areas is determined by the tactical and location markings on the containers.

4-7. PRESERVATION AND PACKING

MCO 4030.36 contains the Marine Corps policy on preservation and packing. Detailed instructions to accomplish the levels of protection are contained in MCO P4030.21. All items adaptable to bin and medium storage, and specified items of bulks storage, must be preserved and packed to conform to level A requirements (explained in chap 3). These items must be stored in field warehousing containers without destroying the level A unit protection. All units will not have the capability to preserve items to conform to level A requirements. If the local base materiel battalion has this capability, its service should be used. A work order or job order is submitted through command channels to have the required unit protection accomplished. All items received for the mount-out block should be packed and placed on location while in garrison. Methods of preservation and packing, and unit and intermediate containers used by Marine Corps Logistics Bases to ship supplies to FMF units will conform to level A requirements. If these containers are not broken, you should place these supply items into your mount-out block without further repacking.

Section II. FIELD STORAGE OPERATIONS

4-8. INTRODUCTION

The rapid processing of supplies and equipment from the rear areas into advanced supply dumps in proper sequence is necessary to provide close supply support for forward units. Problems encountered in establishing new field supply dumps can be reduced by (1) proper use of field warehousing containers, (2) advanced planning for the selection of locations, (3) movement of supplies, and (4) establishment and operation of the new supply installation. The instruction provided in this section is applicable to supply support units when they deploy from garrison in support of FMF operations. It may be impossible to carry out all of the procedures listed here, particularly during the initial phase of the operation. However, this section contains the basic considerations which are fundamental to field storage operations; this information will guide you in selecting and establishing your field supply dump.

4-9. SELECTING AN AREA FOR A FIELD SUPPLY DUMP

When selecting an area for use as a field supply dump, you should consider the following factors:

a. Terrain. The site selected should have good all-weather characteristics to ensure that service is not interrupted during inclement weather. Potential storage areas should be adequately drained, sufficiently level to sustain operations, and be accessible under all weather conditions. An ideal location would be one which contains a thin layer of topsoil with a hard substrata of coral, sandstone rock, or gravel which will support the weight of supplies and the wear of heavy traffic. Organic clay and silt soil locations are least desirable and should be avoided if possible.

b. Access. The access roads to the site must remain passable by heavily-loaded trucks under all weather conditions. There should be more than one road to the source of supply and to the customers because the main supply route (MSR) is not always available for use. Within the dump site, a network of roads is required. Large supply dumps of a semipermanent nature may require considerable road improvement and construction.

c. Natural cover. Use natural cover for protection of supplies. Good judgment is necessary in selecting natural cover; for example, thick woods provide good cover but are damp in winter and become a fire hazard in the fall and summer. Avoid isolated wooden areas because they attract attention and provide excellent targets for enemy aircraft and artillery.

d. Size of area. The site selected for the supply dump should be large enough to fulfill the immediate requirements for storage space and still provide room for expansion. There must be space for resupply shipments, excesses from forward units, and captured enemy equipment. You should also consider the type of supplies (hazardous or nonhazardous) and the length of time the site will be occupied.

e. Primary location. The primary field storage location should be centrally located in relation to the supported units and the resupply point. The central location of this position should allow for the maximum of support to the using unit.

f. Fire protection. The greatest danger in a supply dump is fire. An area in which flammable material is stored must be provided with firefighting equipment such as fire barrels, buckets, extinguishers, and handtools (brush axes and shovels).

g. Drainage. Good drainage must be provided in storage areas, since most supplies deteriorate very rapidly in the presence of moisture. Supplies should not be placed in low areas, such as dry river beds, which may be flooded during rain. If low areas are considered because they provide excellent protection from bombardment, you should seek local advice to determine the effect of heavy rainfall on the condition of the proposed storage area.

h. Security. The area occupied should be small enough so that a security force, capable of defending the area from light enemy attacks, can be organized from supply personnel operating in the area. All personnel should be trained in nuclear, biological, and chemical defensive and recovery methods (as directed by MCO 3400.4).

i. Alternate location. An alternate location should always be selected for use in the event that the primary location cannot be occupied. This location may also used for storing any overflow of supplies and equipment which cannot be stored in the primary location.

4-10. SUPPLY DUMP LAYOUT

A field supply dump layout is an overlay of the storage area which outlines the location of all supplies and facilities, traffic control points, direction of traffic, and relationship of the forward edge of the battle area (FEBA). There are basically two types of field supply dump layouts: the roadside and depth-storage. Each dump layout will vary because of terrain features, road accessibility, weather conditions, and operational requirements.

a. Roadside supply dump layout. If this type of layout (fig 4-10) is used, stacks of supplies are placed on either side of and parallel to the MSR. The advantages of this layout are: Access to supplies is good; no improvement or maintenance is required to additional roads; and it is simple to establish and relocate. The disadvantages of this type of layout are: It causes congestion on the MSR; it interferes with troop movements on the MSR; and troops moving along the MSR may pilfer supplies.

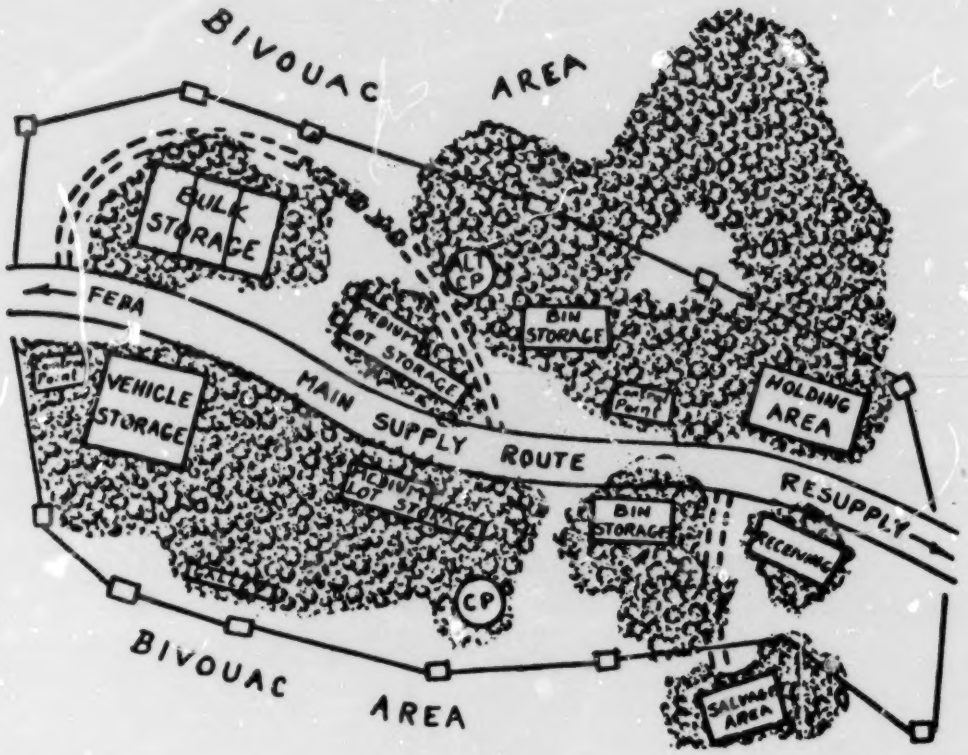


Fig 4-10. Typical roadside supply dump layout.

b. Depth supply dump layout. This type of layout (fig 4-11) is considered standard for use by supply support units of the FMF. First, an area is selected with secondary roads which are either available or which can be easily established. Stocks of supplies are stored away from the MSR. The advantages of this type layout are:

(1) Access to supplies is good.

(2) Supplies may be dispersed.

(3) There are sufficient loading/off loading points.

(4) Traffic is easy to control through the dump.

(5) There is room for rapid stock location.

(6) The area is easy to defend.

(7) This type of dump does not interfere with the traffic on the MSR.

The disadvantages of this type of dump are: Road building and maintenance are required, and it is difficult to camouflage.

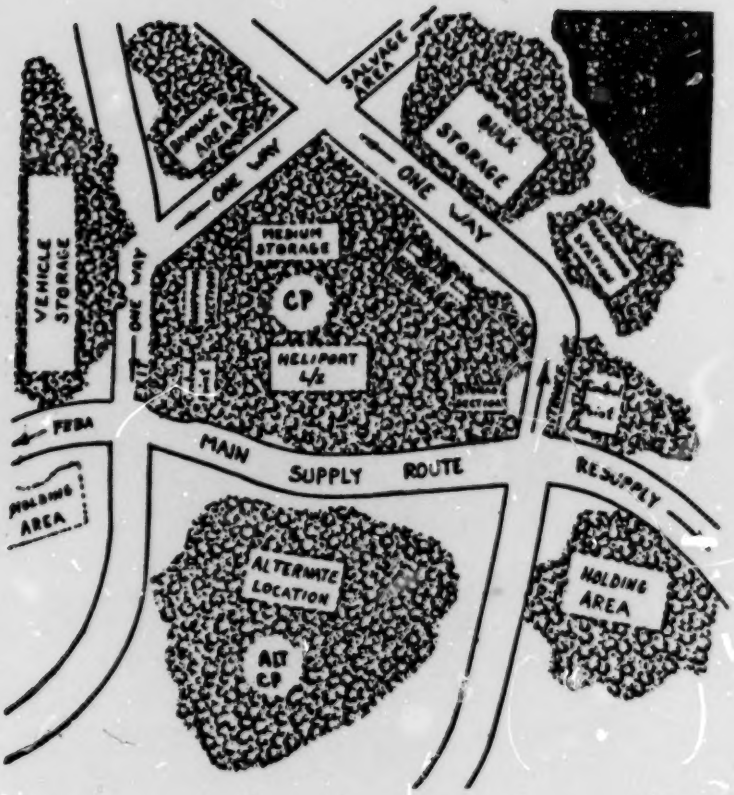


Fig 4-17. Typical depth supply dump layout.

4-11. PROTECTION OF SUPPLIES FROM THE ELEMENTS

The three fundamental principles which must be observed in the protection of supplies from the elements are adequate storage shelter, dunnage, and ventilation.

a. Shelter

(1) Existing buildings or structures. Existing buildings or structures may be available for use in a field supply dump location. Before they can be used, they should be inspected for structural adequacy and cleared of flammable materials and debris. Each structure should be inspected for rubble, stones, and building materials that may fall and injure personnel or damage supplies. If the building was previously occupied by the enemy, it should be inspected completely, before use, for boobytraps or delayed-action landmines.

(2) Caves and tunnels. Supplies may be stored in caves and tunnels which are reasonably dry and free from seepage. Most types of supplies can be stored in caves and tunnels; however, adequate ventilation must be provided for supplies which give off dangerous fumes.

(3) Use of tents. When tents are used to protect supplies, they should be ventilated during the day by raising the sides and opening the ventilators. When tents are ventilated properly, air will circulate freely around the stacks of supplies. At night and during rainy weather, tents should be laced tightly and the sides should be staked down to prevent moisture from condensing on the supplies.

(4) Use of tarpaulins. To provide sufficient air space for ventilation and the necessary slope so rain water will drain off, the tarpaulin can be supported by boards, rods, pipes, or branches. The edges must be tied out to permit free circulation of air.

b. Dunnage

(1) Installation. The bottom layer of supplies must be raised off the floor or ground to maintain a ventilated space under all stacks. This space is necessary to protect the supplies from water and dampness. The area should be cleared of all vegetation and rocks, and the bare earth should be exposed and leveled before the dunnage is laid in place. On soft ground, heavy, well-supported dunnage should be used to prevent a stack of supplies from sinking into the ground.

(2) Dunnage material. Discarded lumber or lumber from used containers is usually the best dunnage material available in the area of operations. If lumber is not available, you may use trees, bricks, material from wrecked buildings, small wooden or metal containers filled with sand or dirt, or other discarded materials. When available, metal dunnage from discarded landing mats or railroad tracks should be used because it reduces fire hazards.

c. Ventilation. Stacks of supplies should be limited in height to allow for 2 feet of airspace between the top of the stack and the cover and to prevent excess weight from crushing the lower layers of containers. Stacks should be arranged to permit free circulation of air around and between the containers. Boxes should not be jammed against each other. Aisles will provide ventilation, fire protection, and access to the supplies.

4-12. CAMOUFLAGE

To achieve good camouflage, you must keep the appearance of an area the same as it was before occupation. Noticeable changes in terrain may be spotted easily by enemy reconnaissance. A supply installation cannot be concealed, but the extent and scope of the installation can be concealed by proper use of camouflage. Camouflage of supplies can be accomplished by observing the following basic considerations:

a. Shadows. Avoid deep shadows and regular outlines. To reduce shadows cast by stacks of supplies, the piles should be pyramid-shaped and approximately 4 feet in height. Regular outlines may be broken by staggering rows of stacks, alongside existing hedgerows, stone walls, and fences.

b. Use of natural materials. Stacks of supplies should be placed under existing cover in orchards or woods, or natural materials (such as, sod, dirt, branches, or stones) should be placed on top of the piles. Natural materials should not be obtained by changing the appearance of the terrain. Green material will wither and turn brown after it has been used; therefore, it should be changed periodically so that it will continue to blend with the natural surroundings. When using dry foliage or brush, be careful because this material is a fire hazard.

c. Appearance of the terrain. Avoid changing the natural appearance of the terrain. Unless necessary, new roads, trails, or paths should not be built. If they are required, they should be constructed under overhead cover if possible.

d. Surrounding area. All areas and installations in the immediate vicinity of the supply dump, such as billeting areas and galley installations, must be inspected frequently to ensure that clothing, pots, pans, etc., do not give away the location of the position.

Section III. COURSE SUMMARY

4-13. SUMMARY

a. Now that you have completed your study of this basic warehousing course, you are ready to review it to prepare for the final examination. It is recommended that you study the main points in each chapter as brought out in the lessons. Some of these main points are: the types of warehouses; use of a planograph and its overlay; the day-to-day maintenance and use of a locator system; basic principles and procedures to apply in the movement, packaging, packing, and marking of supplies; and the preparation of supplies for mount-out or deployment purposes.

b. Nearly every item being used by the Marine Corps today has been received, stored, and issued by warehousing personnel. Personnel who are responsible for the continual movement of these supplies to using units have a key job and a large responsibility for the success of the Marine Corps' mission. A thorough understanding of the principles and procedures taught herein will give you an excellent beginning in warehousing, and will serve as the basis for additional study in occupational field 30.

BASIC WAREHOUSING

Lesson 4

Field Warehousing and Storage Operations

STUDY ASSIGNMENT: MCI 30.1k, Basic Warehousing, chap 4.

LESSON OBJECTIVE: To teach you the basic principles and procedures of field warehousing and storage operations as applied in the Fleet Marine Force.

WRITTEN ASSIGNMENT:

VALUE: 1 Point Each

A. Multiple Choice: Select ONE answer which BEST completes the statement or answers the question. After the corresponding item number on the answer sheet, blacken the appropriate circle.

1. How many storage categories are there in field warehousing?

   a. 2
   b. 3
   c. 4
   d. 5

2. How are items stored in a bin storage unit?

   a. Wooden boxes are used as shelves
   b. A fiberboard insert is used to contain the items
   c. Individual crates are built for large spare parts
   d. Wooden boxes are skid-mounted to contain the inserts

3. A 32- x 40-inch box pallet may be used for bin storage by units having

   a. the equipment and personnel to build them.
   b. organic materials handling equipment.
   c. a requirement for more than 30 bin sections.
   d. more than three mount-out block designators.

4. Which field warehousing section contains repair parts too large for a fiberboard insert, but not large enough to fill an individual container?

   a. Bin storage
   b. Medium storage
   c. Bulk storage

5. The main purpose of a stock locator system is to

   a. allow effective inventories.
   b. furnish a numbering system for controlling boxes.
   c. provide a record of the quantities on hand.
   d. permit you to find all items.

6. The field warehousing stock locator file should be maintained in _____ sequence.

   a. insert
   b. location
   c. storage unit
   d. stock number

7. A field warehousing locator card contains all of the following data EXCEPT

   a. stock number.
   b. unit of issue.
   c. location number.
   d. quantity on hand.

8. An item is stored in fiberboard insert number B, in box pallet bin unit number 112, shelf B, and the box pallet is stored in dump number 06. The correct stock location number is

   a. C-06-1-112-B-B.
   b. C-06-1-112-A-B.
   c. C-06-2-112-A-B.
   d. C-06-2-112-B.

NOTE: Items 9 - 13 are based on the following stock location number: C-02-1-016-B-G.

9. The digits 016 identify a(an)

   a. bin unit.
   b. medium storage box pallet.
   c. bulk storage crate
   d. overseas shipping container.

10. The last digit identifies a

   a. wooden pallet.
   b. bin boxes storage unit.
   c. box pallet.
   d. fiberboard insert.

11. What is the wooden box number?

   a. 1
   b. B
   c. G
   d. 016

12. The supply dump number is indicated by the digit(s)

   a. 02.
   b. 016.
   c. B.
   d. G.

13. What type of storage is indicated by this location number?

   a. Bin storage
   b. Medium storage
   c. Bulk storage

14. The fourth digit (number or letter) of a field warehousing stock location number identifies a

   a. wooden box.
   b. bin unit.
   c. type of storage.
   d. supply dump.

15. Location C-04-3-621-A-A identifies a

   a. fiberboard insert in bin storage.
   b. crate in bulk storage.
   c. medium storage unit.
   d. Mount-out block designator.

16. In stock location number C-01-1-005-A-A, what does the first digit represent?

   a. Wooden box number
   b. Supply dump number
   c. Type of storage
   d. Mount-out block designator

17. Which type of storage is indicated when the fourth digit of a location number is 2?

   a. Bin storage
   b. Bulk storage
   c. Medium storage
   d. Vehicles

18. What disadvantage does the manual locator system have?

   a. It limits space for recording location information
   b. It lacks flexibility
   c. It increases the chance of human error
   d. Its installation is too costly

19. How large is the fiberboard insert with stock number 8115-00-753-5034?

   a. 14-1/4 x 6 x 9-1/4 inches
   b. 14-1/4 x 6 x 4-7/8 inches
   c. 14-1/4 x 12 x 4-7/8 inches
   d. 14-1/4 x 12 x 9-3/4 inches

20. Which stock number identifies a wooden box used for a bin storage unit?

   a. 8115-00-685-5171
   b. 8115-00-753-5033
   c. 8115-00-753-5034
   d. 8115-00-753-5035

21. The basic medium storage unit may be composed of a box pallet or a

a. standard bin storage unit.
b. metal-edge fiberboard insert.
c. reusable shipping container.
d. wooden crate or box.

22. Which specification should you refer to for preservation methods?

a. MIL-A-140
b. MIL-B-121
c. MIL-D-3464
d. MIL-P-116

23. You place the bin number on each metal edged fiberboard insert in order to identify the insert

a. as a bin insert.
b. with the correct wooden box.
c. with the correct bin unit.
d. with the correct dump.

24. How large are location markings on a fiberboard insert in a bin unit?

a. 1/2-inch
b. 3/4-inch
c. 1-inch
d. 1-1/4-inch

25. When marking fiberboard inserts, you can use either yellow or

a. orange.
b. red.
c. white.
d. black.

26. The size of location markings on the box pallet type medium storage unit should be

a. 1-inch.
b. 2-inches.
c. 3-inches.
d. 4-inches.

27. Which color is used for location markings on bulk storage containers?

a. Orange
b. Red
c. White
d. Black

28. Access to the contents of field warehousing containers should be maintained in garrison to permit

a. maintenance and inventory.
b. expansion and relocation.
c. inspection and ventilation.
d. preservation and packing of items.

29. The sequence of moving supplies into their proper storage area is determined by the

a. weight of containers.
b. container tactical and location markings.
c. level of preservation.
d. availability of materials handling equipment.

30. What level of preservation and packing must be applied to items in bin storage and medium storage?

a. Level A
b. Level B
c. Industrial packaging

31. When selecting a site for a field supply dump, you should look for a(an)

a. level area with clay soil.
b. area with rocky ground and thin top soil.
c. dry wooded area.
d. area with deep top soil.

32. What is the greatest danger to supplies stored in a supply dump?

a. Enemy action
b. Fire
c. Flood
d. Pilferage

33. Which is a disadvantage of a roadside supply dump?

a. It is difficult to relocate
b. Road improvement is required
c. Access to supplies is poor
d. Supplies may be pilfered

34. Which is a disadvantage of a depth supply dump?

a. It causes congestion on the main supply route
b. It interferes with troop movement on the main supply route
c. It requires road building and maintenance
d. Troops can pilfer supplies while moving along the main supply route

35. The bottom layer of supplies should be raised off the ground in a field supply dump to

a. provide ventilation.
b. reduce the hazard of fire.
c. prevent the dunnage from sinking into the ground.
d. level the stacks on sloping terrain.

36. A field supply dump should be camouflaged to conceal the

a. main supply route.
b. supply installation completely.
c. extent and scope of the supply dump.
d. access roads from the main supply route.

Total Points: 36

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